DOCUMENT RESUME

ED 205 782 CE 029 796

AUTHOR	Hepburn, Larry; Shin, Masako
TITLE	Multi-Cultural Competency-Based Vocational Curricula. Automotive Mechanics. Multi-Cultural Competency-Based Vocational/Technical Curricula Series.
INSTITUTION	Southern Illinois Univ., Carbondale. School of Technical Careers.
SPONS AGENCY	Illinois State Office of Education, Springfield. Div. of Adult Vocational and Technical Education.
PUB DATE	Jun 81
CONTRACT	R-33-10-C-0442-400; R-33-21-J-0542-400
NOTE	390p.; For related documents see note of CE 029 793.
AVAILABLE FROM	Division of Adult, Vocational and Technical Education, Illinois Office of Education, 100 North First St., Springfield, IL 62777 (write for price).
LANGUAGE	English; Spanish; Lao
EDRS PRICE	MF01/PC16 Plus Postage.
DESCRIPTORS	Air Conditioning; *Auto Mechanics; Behavioral Objectives; *Competency Based Education; Curriculum Guides; Heating; Student Evaluation; Technical Education; Vocabulary; *Vocational Education
IDENTIFIERS	*Bilingual Materials

ABSTRACT

This document, one of eight in a multi-cultural competency-based vocational/technical curricula series, is on automotive mechanics. This program is designed to run 36 weeks and cover 10 instructional areas: the engine; drive trains--rear ends/drive shafts/manual transmission; carburetor; emission; ignition/tune-up; charging and starting; alignment; automatic transmission; brakes; and air conditioning and heating. A duty-task index lists competencies in each instructional area that the student should be able to perform at the end of the program. For example, in the standard and power steering section, a student should be able to (1) check manual steering gear fluid level, and (2) replace belts and adjust tension. In section 1, each instructional task area contains a list of performance objectives, evaluation criterion, performance guide, and a list of tasks to be covered. In section 2, the introduction and duty-task index is repeated in English, Spanish, and Laotian. Section 3 lists technical terms concerning automotive mechanics in English, Spanish, and Laotian. (CT)

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ED205782

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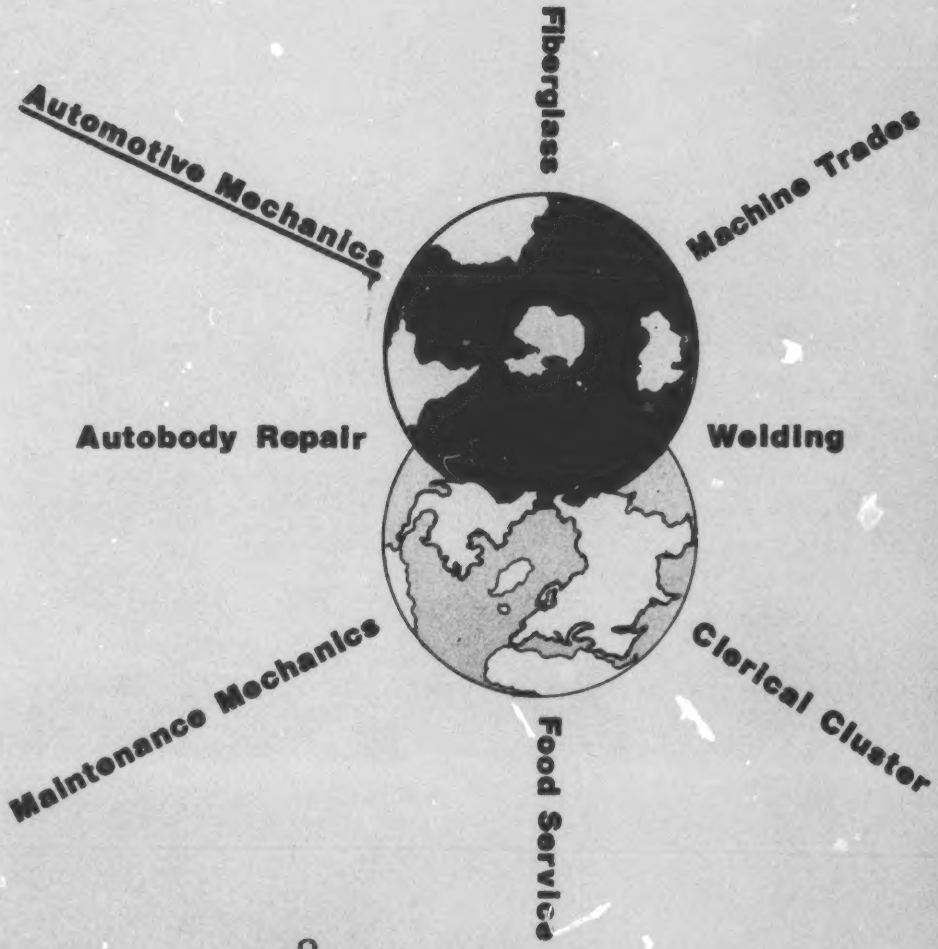
Technical Education



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Multi-cultural Competency-based Vocational/Technical Curricula Series

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Adult,
Vocational and
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Research and
Development Section

June 1981

Career Development Center
Project Development and Management
School of Technical Careers
Southern Illinois University at Carbondale

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    AUTOMOTIVE MECHANICS

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- English
- English/Spanish
- English/Laotian

ILLINOIS STATE BOARD OF EDUCATION

Department of Adult, Vocational and Technical Education
Research and Development Section

Product Abstract

1. Title of material Multi-Cultural, Competency-Based, Vocational Curricula Series: AUTOMOTIVE MECHANICS

2. Date material was completed June, 1981

3. Please check one: New Material ☐ Revised Material ☒

4. Originating agency Project Development & Management, School of Technical Careers
Address Southern Illinois University, Carbondale, IL Zip Code 62901

5. Name(s) of developer(s) Larry Hepburn, Project Director
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6. Developed pursuant to Contract Number R-33-10-C-0442-400 (Phase I)
R-33-21-J-0542-400 (Phase II)

7. Subject Matter (Check only one according to USOE Code):

USOE Code

☐ 01 Agricultural Education
☐ 03 Business and Office Education
☐ 04 Distributive Education
☐ 07 Health Occupations Education
☐ 09 Home Economics Education
☐ 10 Industrial Art Education
☐ 16 Technical Education
☒ 17 Trade and Industrial Education
☐ 22 Cooperative Education
☐ Career Education
☐ Other (Specify)

8. Education Level:

☐ Pre-K Thru 6 ☐ 7-8 ☒ 9-10 ☒ 11-12
☒ Post-Secondary ☒ Adult ☒ Teacher (Pre-Service)
☒ Administrator (Pre-Service) ☐ Other Specify)

9. Intended for Use By:

☒ Student ☒ Classroom Teacher ☐ Local Adminstrator
☐ Teacher Educator ☐ Guidance Staff ☐ State Personnel
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Vocational Instructors/Limited English-Speaking Adults

10. Student Type:

☐ Regular ☒ Disadvantaged ☐ Handicapped
☒ Limited English Proficiency ☒ Other
(Specify) Adult

11. Medium and Format of Materials:

____HARDCOPY

No. of Pages 385
__Paper bound
__Hard bound
X Loose-leaf

____VIDEOTAPE

____Minutes
__B & W
__Color
____inches

____FILM

____Minutes
__B & W
__Color
____mm

____MICROFICHE

____B & W
____Color

Photos: Yes____ No X
Diagrams: Yes____ No X

____SLIDES

No. of Frames____
__B & W
__Color
__Audio
__Carousel provided
__Other packaging used
(Specify)____________

____FILM STRIPS

No of frames____
__B & W
__Color
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____AUDIO

__Automatic synch
__ ________Hz
__Manual Cue
__Reel
__Cassette
__Cartridge

____OTHER

Specify:
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12. Availability:

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13. Copyright Restrictions: None

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16. General Description (State the general objective and suggested method of use. Summarize the content and tell how it is organized. Continue on back of this sheet or on another sheet, if necessary.):

AUTOMOTIVE MECHANICS series contains:

1. Competency-Based Curriculum in VESL.
2. Program Introduction and Outline in English; Laotian; and Spanish.
3. Lexicon of Technical Terms in VESL; English-Laotian; and English-Spanish versions.

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COMPETENCY-BASED CURRICULUM SERIES

AUTOMOTIVE MECHANICS

(MECHANICS HELPER)

OUR GOAL

TO ACHIEVE THE MAXIMUM IN THE MINIMUM TIME

TABLE OF CONTENTS

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INTRODUCTION

The Automotive Mechanics Program runs 36 weeks covering the repair-work areas of engine (4 weeks); drive trains - rear ends/drive shafts/manual transmission (4 weeks); carburetor (3 weeks); emission (3 weeks); ignition/tune-up (3 weeks); charging and starting (4 weeks); alignment (4 weeks); automatic transmission (4 weeks); brakes (4 weeks); and air conditioning and heating (3 weeks).

The class meets two hours each day in a related education class (a basic education program to improve the student's reading/English/mathematics skills necessary for vocational training and adequate performance at the entry level of employment) or in a GED class (to prepare for the General Education Development Test - a high school equivalency certification test), and six hours each day 5 days a week in the shop.

The student in the Automotive Mechanics Program will acquire the knowledge and skills required of a mechanics helper in all the repair areas. The student also will receive the additional training necessary to perform as a service mechanic with an option to concentrate in one or two repair areas and/or to perform as an automobile journeyman mechanic depending on his or her aptitude, interest and progress in class.

At the end of the training period, the student will be ready for job entry at the apprentice level.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Mechanics Helper*)

I. ENGINE OVERHAUL

1. Remove engine from vehicle.
2. Steam clean engine.
3. Remove and replace oil pans.
4. Clean engine parts and check for condition.
5. Replace exhaust manifold(s).
6. Inspect exhaust system.
7. Replace muffler.
8. Replace tailpipe assemblies.

II. DRIVE TRAINS

1. Inspect drive shaft, U-joints, and center bearings.
2. Lubricate or replace speedometer cable and housing.
3. Remove and replace speedometer cable and housing.
4. Lubricate universal joints.
5. Replace manual transmission.
6. Replace manual transmission rear seal, gasket and bushing.
7. Replace transmission mounts.

III. AUTOMATIC TRANSMISSIONS

1. Clean and inspect transmission visually.
2. Replace external seals, gaskets, and lines on automatic transmissions.
3. Service filter.

IV. ELECTRICAL SYSTEMS

1. Clean, gap and test spark plugs.
2. Inspect the light systems.
3. Service or replace batteries, cables and battery box.

V. CARBURETOR AND EMISSION

1. Clean carburetor.
2. Replace fuel filter.
3. Clean fuel filter.
4. Inspect, service, or replace carburetor air cleaner.
5. Install carburetor.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Mechanics Helper*)

VI. STANDARD AND POWER STEERING

1. Check manual steering gear fluid level.
2. Replace belts and adjust tension.

VII. BRAKING SYSTEMS

1. Bleed hydraulic brakes.
2. Replace brake hoses and lines; replace hydraulic lines and fittings.

VIII. FRONT ENDS

1. Adjust and repack front wheel bearings.
2. Lubricate ball joints.
3. Lubricate the front and rear suspension.
4. Replace shock absorbers and mounting.

IX. COOLING SYSTEMS

1. Check coolant freezing point.
2. Inspect, adjust, or replace fan belts.
3. Remove and replace radiators.
4. Replace core plugs (freeze plugs).
5. Replace heater hoses.
6. Replace radiator hoses.
7. Replace variable-speed fan.
8. Replace water pump.

X. HEATERS

1. Replace defroster hose.

AUTOMOTIVE MECHANICS

I. ENGINE OVERHAUL

Tasks* covered by Mechanics Helpers:

1. Remove engine from vehicle.
2. Steam clean engine.
3. Remove and replace oil pans.
4. Clean engine parts and check for condition.
5. Replace exhaust manifold(s).
6. Inspect exhaust system.
7. Replace muffler.
8. Replace tail pipe assemblies.

DUTY: ENGINE OVERHAUL

TASK: Remove engine from vehicle.*

Performance Objectives:

Given an automobile requiring an engine removal, the service manual, hand tools and necessary equipment, the student will remove the engine from the vehicle following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will remove the engine from the vehicle without incurring any damage to the surrounding items and equipment, to the satisfaction of the instructor.

Performance Guide:

1. Remove the hood.
2. Disconnect and remove the battery.
3. Raise the vehicle and set the stands properly.
4. Drain the cooling system.
5. Remove the radiator; disconnect cooler lines when applicable.
6. Disconnect the engine supports and exhaust manifold:
   a. When applicable, remove with transmission.
   b. Remove the transmission oil cooler lines and linkage.
   c. Drain the transmission.
   d. Disconnect the drive line.
7. Remove the fan assembly.
8. Disconnect the fuel line and plug.
9. Disconnect all the electrical connections.
10. Disconnect the accelerator linkage.
    a. When applicable, remove air conditioning unit without removing hoses.
    b. If the hoses must be removed, make sure that the air conditioning unit has been evacuated.
11. Attach a chain: Make certain all objects are clear of the chain to avoid any damage.
12. Remove the engine and place it on a suitable stand.
13. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Steam clean engine.*

Performance Objectives:

Given a demonstration and a steam cleaner, the student will steam clean the engine surface.

All heavy deposits of dirt and grease must be dissolved and washed away. The ignition parts must be free of moisture.

Evaluation Criterion:

The student will steam clean a soiled engine surface to the satisfaction of the instructor.

Performance Guide:

1. Obtain the cleaning equipment and cleaning solvent.
2. Steam clean the engine according to the specifications and procedures set by the manufacturer of the equipment:
   Protect distributor and carburetor by covering with waterproof material.
3. Dry as needed.
4. Protect against rust with the proper anti-rust agent, where applicable.
5. Start the engine and check for any malfunctions occurring due to moisture or foreign particles in the operational parts.
6. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Remove and replace oil pans.*

Performance Objectives:

Given an automobile, proper hand tools and equipment, and service manual, the student will remove and replace the oil pan following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will remove and replace the oil pan to the satisfaction of the instructor.

Performance Guide:

1. Raise the car and put the safety stands in place.
2. Drain oil.
3. Remove all obstructions: cross members; steering arms; linkage and exhaust system where necessary.
4. Remove the pan bolts and lower the oil pan.
5. Remove the gasket and seals: Clean the gasket surface.
6. Replace the gasket; align it properly.
7. Reverse procedures for installation.
8. There will be no leaks or stoppages in the system after the replacement of the oil pan.
9. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Clean engine parts and check for condition.*

Performance Objectives:

Given a disassembled engine, the proper cleaning equipment and instructions, the student will clean and inspect each engine part for proper condition.

Evaluation Criterion:

The student will clean each engine component and identify those parts needing repair to the satisfaction of the instructor.

Performance Guide:

1. Clean parts: head and manifold.
   Scrape carbon from the heads and manifold, wirebrush old gaskets, and remove valves before submerging in the cleaning tank.
2. Check the cleaned parts for wear, warpage and any other abnormal conditions that exist.
3. Consult the manufacturer's service manual for wear specifications..
4. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Replace exhaust manifold(s).*

Performance Objectives:

Given an automobile with broken exhaust manifolds, tools and equipment and service manual, the student will remove and install new exhaust manifolds, following the manufacturer's procedures.

Evaluation Criterion:

The student will remove the old manifolds and install the new ones, to the satisfaction of the instructor.

Upon completion of the repair, the exhaust manifold will not rattle or leak fumes.

Performance Guide:

1. Disconnect the battery cable.
2. Raise the vehicle and place the safety stands under the frame.
3. Disconnect the exhaust pipe and then lower the vehicle.
4. Remove the exhaust manifold.
5. Free and lubricate the heat riser when applicable.
6. Scrape the old gaskets (where gaskets are used) from the mating surface.
7. Replace the gaskets and manifold.
8. Raise the vehicle and connect the exhaust pipes.
9. Connect the battery cable.
10. Operate the engine and check for leaks and rattles.
11. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Inspect exhaust system.*

Performance Objectives:

Given an automobile, the student will check the complete exhaust system for holes, defects, broken or missing components, and rust-outs.

Evaluation Criterion:

The student will inspect the exhaust system and identify the components that need repairs or servicing to the satisfaction of the instructor.

Performance Guide:

1. Raise the car and place it on jack stands.
2. Inspect entire exhaust system for leaks, rattles, looseness, holes, rusting, gaskets, hangers and clamps.
3. Make a report on the parts that require repair or servicing to the instructor.

DUTY: ENGINE OVERHAUL

TASK: Replace muffler.*

Performance Objectives:

Given an automobile with a faulty muffler, proper tools and equipment, and service manual, the student will remove and replace the muffler following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will remove and replace the muffler to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle on a suitable lift or stands.
2. Remove the necessary clamps and hangers to remove the tailpipes.
3. Using a cutting or heating device, remove the tail pipe.
4. Using a cutting or heating device, remove the muffler.
5. Install the muffler and pipes in the reverse order.
   Make sure that the pipes and mufflers are clear of the chassis and axle to avoid possible rattle.
6. Test the exhaust system for proper operation:
   There should be no leaks or unwarranted noises.
7. Have the instructor check your installation of mufflers.

DUTY: ENGINE OVERHAUL

TASK: Replace tailpipe assemblies.*

Performance Objectives:

Given a car with a defective tailpipe assembly, the proper tools and equipment, the student will remove and replace the tailpipe assembly following the manufacturer's recommendations.

Evaluation Criterion:

The student will remove and replace the tailpipe assembly to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle and place on the jack stands.
2. Disconnect the tailpipe assembly from the muffler.
3. Replace the tailpipe sections, checking and/or replacing hangers and clamps as necessary.
4. Reconnect the tailpipe and muffler assembly.
5. Lower vehicle and road test for leaks, rattles and clearances.
6. Have the instructor check your work.

AUTOMOTIVE MECHANICS

II. DRIVE TRAINS

Tasks* covered by Mechanics Helpers:

1. Inspect drive shaft, U-joints, and center bearings.
2. Lubricate or replace speedometer cable and housing.
3. Remove and replace speedometer cable and housing.
4. Lubricate universal joints.
5. Replace manual transmission.
6. Replace manual transmission rear seal, gasket and bushing.
7. Replace transmission mounts.

DUTY: DRIVE TRAINS

TASK: Inspect drive shaft, U-joints, and center bearings.*

Performance Objectives:

Given a drive line assembly with known defects, the proper tools and equipment and service manual, the student will inspect the drive shaft, U-joints, and center bearings for malfunctions.

Evaluation Criterion:

The student will inspect the drive line assembly with malfunctions and recognize all the identified malfunctions, to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle and place on jack stands.
2. Remove the drive shaft.
3. Remove the center bearing snap ring and bearing assembly.
4. Check U-joints on the drive shaft for wear, oil leakage and excessive play.
5. Check the center bearing for wear and looseness.
6. Clean and relubricate U-joints and the center bearing with recommended lubricants.
7. Replace U-joint and center bearing assembly.
8. The drive shaft will operate without excessive noise and vibration, and U-joints will not leak.
9. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Lubricate or replace speedometer cable and housing.*

Performance Objectives:

Given a vehicle, the proper tools, lubricant, and service manual, the student will lubricate the speedometer cable.

Evaluation Criterion:

The student will lubricate the speedometer cable and housing to the satisfaction of the instructor.

Performance Guide:

1. Locate the manufacturer's information on the vehicle requiring speedometer lubrications.
2. Determine the cable routing and location of securing clips if equipped.
3. Remove the speedometer cable and housing.
4. Repack the speedometer as required.
5. Check the speedometer cable and housing for kinks before installing.
6. Check the speedometer head for possible binding problems.
7. Reconnect the cable to the head and replace the securing clips.
8. Road test to check the speedometer operation.
9. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Remove and replace speedometer cable and housing.*

Performance Objectives:

Given a car with a broken speedometer, the proper tools and equipment, the student will remove and replace the speedometer cable and housing, according to the manufacturer's recommendation.

Evaluation Criterion:

The student will remove and replace the speedometer cable and housing to the satisfaction of the instructor.

Performance Guide:

1. Locate the manufacturer's information on the car requiring the speedometer cable service or replacement.
2. Determine the cable routing (to the transmission or front wheel, etc.), and locate the securing clips if equipped.
3. Remove the speedometer cable housing.
4. Replace the speedometer as required.
   If a broken cable is the reason for servicing, determine the reason for the damage before a new cable is installed.
5. Replace any locking devices that were removed.
6. Road test to check the speedometer operation: The speedometer must work without any binding or excessive noise.
7. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Lubricate universal joints.*

Performance Objectives:

Given a vehicle requiring lubrication to the universal joints, the necessary tools, equipment, and service manual, the student will lubricate the universal joints, following the manufacturer's recommended procedures and specifications.

Evaluation Criterion:

The student will lubricate the universal joints to the instructor's approval. The U-joint will function without leaking around the seals.

Performance Guide:

1. Raise the vehicle to allow ample access to the drive shaft.
2. Grease the fittings on the joints: allow one pump of grease from the grease gun.
3. Check to see if the U-joints are loose and dry: If so, replace them.
4. Take the vehicle off the stands and test drive.

DUTY: DRIVE TRAINS

TASK: Replace manual transmission.*

Performance Objectives:

Given a vehicle with a manual transmission, proper tools, equipment and service manual, the student will replace the transmission following the manufacturer's recommendations.

Evaluation Criterion:

The student will remove and replace the manual transmission to the satisfaction of the instructor. The transmission will not leak, shimmy, or contain any problems in shifting upon completion of the work.

Performance Guide:

1. Follow all the safety procedures: Jack up the vehicle and place the safety stands under the frame.
2. Drain transmission.
3. Remove the drive shaft.
4. If the mounts are attached to the transmission, support the motor with a jack and then remove the mounts.
5. Remove the transmission.
6. To install the replacement, reverse the procedure.
7. Refill the transmission with lubricant.
8. Road test for proper operation.

DUTY: DRIVE TRAINS

TASK: Replace manual transmission rear seal, gasket and bushing.*

Performance Objectives:

Given a standard transmission, proper tools, equipment and service manual, the student will replace the rear seal, gasket and bushing, following the manufacturer's recommendation.

Evaluation Criterion:

The student will replace the rear seal, gasket and bushing on the standard transmission. There will be no leaks or excessive noise in the repaired areas.

Performance Guide:

1. Follow all the safety procedures: Jack up the vehicle and place the safety stands under the frame.
2. Drain transmission.
3. Remove the drive shaft.
4. Remove the output shaft housing from transmission:
   If the transmission mount is attached to the housing, support the transmission with a jack.
5. Using proper tools, remove and replace the seal and bushing.
6. Install housing using new gaskets.
7. Install the drive shaft.
8. Refill the transmission.
9. Test and check for leaks or excessive noise.

DUTY: DRIVE TRAINS

TASK: Replace transmission mounts.*

Performance Objectives:

Given a vehicle with faulty transmission mounts, tools, equipment, and service manual, the student will replace the transmission mounts, following the manufacturer's recommendation.

Evaluation Criterion:

The student will replace the transmission mounts, to the satisfaction of the instructor.

Performance Guide:

1. Follow all the safety procedures: Jack up the vehicle and place safety stand under frame.
2. Support the rear of motor or transmission with suitable jack.
3. Remove the mount bolts and mounts:
   On some vehicles, the transmission must be raised to remove the mounts.
4. Place new transmission mounts into position and torque to specifications.
5. Remove the support jacks and put the vehicle on the floor.
6. Start the engine and check the mounts for looseness.
7. The mounts must be secured to avoid any noise or shimmying in the transmission.

III. AUTOMATIC TRANSMISSIONS

Tasks* covered by Mechanics Helpers:

1. Clean and inspect transmission visually.
2. Replace external seals, gaskets, and lines on automatic transmissions.
3. Service filter.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Clean and inspect transmission visually.*

Performance Objectives:

Given a vehicle and the necessary cleaning materials, the student will clean the transmission and inspect it for leaks.

Evaluation Criterion:

The student will clean the transmission exterior and identify any leaks in the mechanism to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle in a safe manner to provide access to the transmission.
2. Clean the transmission exterior with a cleaning device.
3. Operate the vehicle until the engine and transmission have attained the normal operating temperature.
4. Inspect the following transmission exterior areas for leakage:
   a. transmission oil pan.
   b. front and rear seals.
   c. transmission drain plug (for looseness).
   d. oil cooler and speedometer drive.
5. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Replace external seals, gaskets, and lines on automatic transmissions.*

Performance Objectives:

Given a vehicle with an automatic transmission, the necessary tools, equipment and service manual, the student will replace the rear transmission seal and bushing, following the manufacturer's recommendations.

Evaluation Criterion:

The student will replace the rear transmission seal and bushing to stop the leaks, to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle to obtain access to the drive line and transmission.
2. Check the service manual for the proper replacement of the transmission rear oil seal and the extension housing bushing.
3. Remove the drive shaft and inspect the yoke for wear or score.
4. Remove and replace the seal and bushing with the proper tools, following the prescribed procedures.
5. Install the drive shaft.
6. Adjust the fluid level, if necessary.
7. Check the seal for oil leaks.
8. Road-test for proper operation.
9. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Service filter.*

Performance Objectives:

Given a vehicle, the necessary tools, equipment and service manual, the student will clean or replace the automatic transmission filter, according to the manufacturer's recommendations.

Evaluation Criterion:

The student will clean or replace the automatic transmission filter to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle to obtain access to the drive line and transmission.
2. Clean the transmission and dust cover on the torque converter.
3. Install the filter following the manufacturer's recommendations and specifications:
    Usually when the transmission filter is replaced, the bands should be adjusted.
4. Refill with fluid.
5. Have the instructor check your work.

AUTOMOTIVE MECHANICS

IV. ELECTRICAL SYSTEMS

Tasks* covered by Mechanics Helpers:

1. Clean, gap and test spark plugs.
2. Inspect the light systems.
3. Service or replace batteries, cables and battery box.

DUTY: ELECTRICAL SYSTEMS

TASK: Clean, gap and test spark plugs.*

Performance Objectives:

Given an automobile needing spark plug service, the necessary tools, equipment and service manual, the student will clean and gap the spark plugs, and replace them in the automobile, according to the manufacturer's recommendations.

Evaluation Criterion:

The student will clean, gap and test the spark plugs to the satisfaction of the instructor.

Performance Guide:

1. Disconnect the spark plug leads from the spark plugs.
2. Remove all spark plugs, noting the cylinder in which they were installed.
3. Clean the excessive carbon or lead deposits from the spark plug tips.
4. Set the gap on the plugs and test them for proper functioning, using the spark plug tester.
5. When a new replacement is not needed, coat the spark plug threads lightly with engine oil and install the plugs.
   CAUTION: Do not overtorque the spark plugs. Check for the manufacturer's torque specifications.
6. Check the spark plug leads for cracks and brittleness; then reconnect the leads to the spark plug.
7. Test-drive the vehicle for proper operation.
8. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Inspect the light systems.*

Performance Objectives:

Given a vehicle and service manual, the student will check the operation of all exterior lights and control switches and determine any malfunctioning.

Evaluation Criterion:

The student will inspect all exterior lights and control switches on the vehicle and identify all the malfunctioning, to the satisfaction of the instructor.

Performance Guide:

1. Conduct a visual inspection of the following:
    - a. parking lights.
    - b. headlights: both high and low beams.
    - c. taillights.
    - d. turn signal lights.
    - e. brake lights.
    - f. marker lights.
    - g. clearance lights.
    - h. backup lights.
    - i. license plate light.
2. Test the operation of all exterior lighting control switches.
3. Make a list of any lighting system not operating in accordance with the manufacturer's standards.
4. Have the instructor check your list.

DUTY: ELECTRICAL SYSTEMS

TASK: Service or replace batteries, cables and battery box.*

Performance Objectives:

Given a vehicle needing battery service, the necessary tools, equipment, and service manual, the student will service and test the battery and cables, conduct a visual check of the battery box, and replace the necessary components, according to the manufacturer's specifications.

Evaluation Criterion:

The student will service or replace and test the batteries, cables, and battery box to correct the problem to the satisfaction of the instructor.

Performance Guide:

1. Remove the battery filler caps.
2. Determine the fluid level.
3. Perform the battery gravity test.
4. Perform the battery load test.
5. Inspect the battery cables visually for breakage, fraying or broken insulation.
6. Perform the voltage drop test on all cables.
7. Replace any defective cables.
8. Inspect and clean the battery box as needed: Clean the cables and the top of the battery.
9. Lubricate the battery terminals with petroleum jelly or other suitable lubricant.
10. Perform the operational check.
11. Have the instructor check your work.

AUTOMOTIVE MECHANICS

V. CARBURETOR AND EMISSION

Tasks* covered by Mechanics Helpers:

1. Clean carburetor.
2. Replace fuel filter.
3. Clean fuel filter.
4. Inspect, service, or replace carburetor air cleaner.
5. Install carburetor.

DUTY: CARBURETOR AND EMISSION

TASK: Clean carburetor.*

Performance Objectives:

Given a vehicle, the necessary tools, equipment and service manual, the student will remove, clean and replace the carburetor, according to the manufacturer's specifications.

Evaluation Criterion:

The student will remove the carburetor, clean and calibrate it, and replace it in the automobile, to the satisfaction of the instructor.

Performance Guide:

1. Check the manufacturer's manual for carburetor servicing procedures and adjustment specifications.
2. Remove the carburetor from the vehicle.
3. Remove the fuel from the carburetor.
4. Disassemble the carburetor and place it in the carburetor cleaner.
5. After cleaning, reassemble the carburetor, replacing the jets, power valve, gaskets and seals as required.
6. Perform all the carburetor adjustments/calibrations.
7. Reinstall the carburetor on the vehicle engine. Bring the engine to normal operating temperature and complete the carburetor adjustments: within ± 50 r.p.m.s of the manufacturer's specifications.
8. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Replace fuel filter.*

Performance Objectives:

Given the necessary hand tools and equipment, the student will replace the fuel filter in a given vehicle.

Evaluation Criterion:

The student will replace the fuel filter to the satisfaction of the instructor.

Performance Guide:

1. Remove the carburetor air cleaner assembly.
2. Disconnect the fuel line at the carburetor.
3. Remove the fuel filter from the carburetor inlet, if necessary.
4. Remove the filter from the fuel line, if in-line type.
5. Replace the fuel filter.
6. Connect the carburetor fuel lines.
7. Check for the fuel leak.
8. Install the carburetor air cleaner assembly.
9. Test-drive the vehicle.
10. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Clean fuel filter.*

Performance Objectives:

Given a vehicle and the necessary tools, equipment and the service manual the student will remove, clean and install the fuel filter, following the manufacturer's recommendations.

Evaluation Criterion:

The student will remove, clean and reinstall the fuel filter to the satisfaction of the instructor.

Performance Guide:

1. Remove the carburetor air cleaner assembly.
2. Disconnect the fuel line at the carburetor.
3. Remove the fuel filter from the carburetor inlet.
4. Remove the filter from the fuel line.
5. Clean the fuel filter with gasoline and blow out the element with air.
6. Connect the carburetor fuel lines.
7. Check for the fuel leaks.
8. Install the carburetor assembly.
9. Have the instructor check your work by test-driving the vehicle.

DUTY: CARBURETOR AND EMISSION

TASK: Inspect, service, or replace carburetor air cleaner.*

Performance Objectives:

Given a vehicle, the necessary hand tools, equipment, and service manual, the student will inspect the carburetor air cleaning element for dirt and clean the element, following the manufacturer's recommendations.

Evaluation Criterion:

The student will inspect and clean or replace the carburetor air cleaner on the vehicle, to the satisfaction of the instructor.

Performance Guide:

1. Remove the carburetor air filter element.
2. Inspect the filter element for dirt: visual inspection using light.
3. Remove excess dirt from the filter, if necessary. If the filter has the paper element, replace it.
4. Replace or reinstall the filter.
5. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Install carburetor.*

Performance Objectives:

Given the necessary hand tools, equipment, and service manual, the student will replace the carburetor on the given vehicle, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will install a carburetor and set the idle speed to the satisfaction of the instructor.

Performance Guide:

1. Remove the carburetor air cleaner.
2. Disconnect the accelerator linkage, fuel line, automatic choke, and vacuum lines, when required.
3. Remove the carburetor.
4. Install the carburetor following steps 1 through 3 in reverse order.
5. Complete the final carburetor servicing, as required.
6. Have the instructor check your work.

AUTOMOTIVE MECHANICS

VI. STANDARD AND POWER STEERING

Tasks* covered by Mechanics Helpers:

1. Check manual steering gear fluid level.
2. Replace belts and adjust tension.

DUTY: STANDARD AND POWER STEERING

TASK: Check manual steering gear fluid level.*

Performance Objectives:

Given a vehicle, the necessary tools, equipment, and service manual, the student will check the manual steering gear fluid level and determine if servicing is necessary to meet the manufacturer's specifications.

Evaluation Criterion:

The student will check the manual steering gear fluid level on a given vehicle and report to the instructor whether servicing is needed.

Performance Guide:

1. Raise the vehicle and install the finder cover.
2. Clean the area around the manual steering gear filler plug.
3. Remove the plug and check the fluid level.
4. Reinstall the filler plug.
5. Check with the instructor on the accuracy of your report.

DUTY: STANDARD AND POWER STEERING

TASK: Replace belts and adjust tension.*

Performance Objectives:

Given a vehicle, replacement belts, the necessary tools, equipment and service manual, the student will replace the alternator/generator belts and power steering belts and adjust the tension to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the worn and cracked alternator/generator and power steering belts with new replacement belts and adjust them to the specified tension.

Performance Guide:

1. Check with the manufacturer's manual for belt removal and replacement procedures and belt tension specifications.
2. Raise the hood and install the fender covers.
3. Loosen the alternator/generator and power steering locking bolts.
4. Install the belts and adjust to the proper tension.
5. Make sure the component locking bolts are secure.
6. Have the instructor check your work.

VII. BRAKING SYSTEMS

Tasks* covered by Mechanics Helpers:

1. Bleed hydraulic brakes.
2. Replace brake hoses and lines, replace hydraulic lines and fittings.

DUTY: BRAKING SYSTEMS

TASK: Bleed hydraulic brakes.*

Performance Objectives:

Given a vehicle with hydraulic brakes, the necessary tools, equipment and service manual, the student will bleed the hydraulic brake system to expell all the air, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will bleed the hydraulic brake system on the given vehicle, to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor, following safety practices.
2. Attach bleeder tanks with recommended brake fluid and air pressure to the master cylinder:
   If no bleeder tank is available, have someone pump the brakes and hold while another opens the bleeders.
3. Bleed the hydraulic system with a bleeder hose, jar, and proper bleeder wrenches, according to the manufacturer's procedures.
4. Expell all the air from all four wheels: Check the brake pedal operation.
5. Disconnect the bleeder tank and recheck the master cylinder fluid level.
6. Road-test the vehicle.
7. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Replace brake hoses and lines, replace hydraulic lines and fittings.*

Performance Objectives:

Given a vehicle with hydraulic brakes, the necessary tools, equipment, service manual, and replacement parts, the student will remove and replace the hydraulic brake lines, hoses and fittings, according to the manufacturer's recommendations.

Evaluation Criterion:

The student will replace the hydraulic brake lines, hoses, and fittings on the given vehicle, to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor and support the vehicle, following safety practices.
2. Disconnect the hydraulic line fittings and remove the brake hydraulic lines.
3. Install the new brake lines.
4. Refill the master cylinder with proper brake fluid and bleed the hydraulic brake system to expell all the air.
5. Check the brake pedal operation.
6. Road-test the vehicle.
7. Have the instructor check your work.

AUTOMOTIVE MECHANICS

VIII. FRONT ENDS

Tasks* covered by Mechanics Helpers:

1. Adjust and repack front wheel bearings.
2. Lubricate ball joints.
3. Lubricate the front and rear suspension.
4. Replace shock absorbers and mounting.

DUTY: FRONT ENDS

TASK: Adjust and repack front wheel bearings.*

Performance Objectives:

Given a vehicle, the necessary tools, equipment and service manual, the student will repack the inner and outer front wheel bearings, according to the manufacturer's specifications.

Evaluation Criterion:

The student will repack the inner and outer front wheel bearings on the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the front of the vehicle from the floor and support the vehicle, following safety practices.
2. Remove the front wheel assemblies and inner wheel bearings.
3. Clean the inner and outer wheel bearings, following the prescribed procedures:
   Inspect the bearings and replace with proper wheel lubricant.
4. Install the inner wheel bearings, new grease seals and wheel assemblies on the vehicle.
5. Install the outer wheel bearings and spindle nut.
6. Adjust wheel bearings following the manufacturer's specifications.
7. Install the cotter pins, and dust hub caps.
8. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Lubricate ball joints.*

Performance Objectives:

Given a vehicle, the necessary tools and equipment, and the service manual, the student will lubricate the upper and lower ball joints, following the manufacturer's specifications.

Evaluation Criterion:

The student will lubricate the upper and lower ball joints on the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the front of the vehicle and support it, following safety procedures.
2. Clean the lubrication zerk fittings (if available) on both upper and lower ball joints.
3. Lubricate the ball joints using the recommended chassis lube.
4. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Lubricate the front and rear suspension.*

Performance Objectives:

Given a vehicle, the necessary lubrication equipment, tools and service manual, the student will lubricate the front and rear suspension components as required by the manufacturer.

Evaluation Criterion:

The student will lubricate the front and rear suspension components to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor and support it, following safety practices.
2. Clean all lubrication zerk fittings of the steering and suspension components.
3. Using the recommended chassis lube, lubricate all front and rear suspension components as required.
4. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Replace shock absorbers and mounting.*

Performance Objectives:

Given a vehicle, the necessary replacement parts, tools, equipment, and service manual, the student will replace the front and rear shock absorbers and mountings, following the manufacturer's specifications.

Evaluation Criterion:

The student will remove and replace the shock absorbers and mountings to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor and support it, following safety practices.
2. Remove the shock absorber upper mounting nuts and locks.
3. Remove the lower mounting bolts/nuts and withdraw the shock absorbers from the vehicle.
4. Install new shock absorbers and rubber bushings following steps 2 and 3 in reverse order:
    Tighten attaching bolts and nuts to the specifications.
5. Have the instructor check your work.

AUTOMOTIVE MECHANICS

IX. COOLING SYSTEMS

Tasks* covered by Mechanics Helpers:

1. Check coolant freezing point.
2. Inspect, adjust, or replace fan belts.
3. Remove and replace radiators.
4. Replace core plugs (freeze plugs).
5. Replace heater hoses.
6. Replace radiator hoses.
7. Replace variable-speed fan
8. Replace water pump.

DUTY: COOLING SYSTEMS

TASK: Check coolant freezing point.*

Performance Objectives:

Given an anti-freeze tester, the student will check the freezing point of the cooling solution within ± 5° of the instructor's reading.

Evaluation Criterion:

The student will determine the degree of anti-freeze protection to + 5° of the instructor's reading within a length of time considered reasonable by the instructor.

Performance Guide:

Follow the manufacturer's instruction in conducting the anti-freeze test:

1. Make certain that the coolant is at the proper level.
2. Insert the anti-freeze tester into the cooling system opening (radiator cap opening).
3. Draw the coolant temperature factor, according to the manufacturer's directions.
4. Have the instructor check your test result.

DUTY: COOLING SYSTEMS

TASK: Inspect, adjust, or replace fan belts.*

Performance Objectives:

Given an automobile, the necessary tools, equipment and a service manual, the student will remove and replace the fan belt, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace and adjust the fan belt, to the satisfaction of the instructor.

Performance Guide:

1. Inspect the fan belt for wear, fraying or cracks: Determine the necessity for removal.
2. Loosen the cap screw controlling the best tension at the top of the alternator.
3. Loosen the alternator mounting bolts slightly.
4. Using a suitable pry, move the alternator in towards the engine: Care must be taken not to damage the alternator.
5. Remove the fan belt.
6. Install a new fan belt.
7. Using a suitable pry bar, move the alternator outward until a proper tension is obtained.
8. Tighten the cap screw controlling the best tension at the top of the alternator.
9. Tighten the alternator mounting bolts.
10. Recheck the belt tension with the Strand Belt Gauge or another suitable gauge.
11. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Remove and replace radiators.*

Performance Objectives:

Given a vehicle, necessary tools, equipment and a service manual, the student will remove and replace the radiator, according to the manufacturer's recommendations.

Evaluation Criterion:

The student will remove the old radiator and replace it with a new one, to the satisfaction of the instructor.

Performance Guide:

1. Drain the cooling system.
2. Remove any components which may prevent access to the radiator and the hoses.
3. Disconnect the upper hose only from the radiator.
4. Disconnect the lower hose only from the radiator.
5. Disconnect the transmission cooling line from the radiator, if necessary.
6. Remove the cooling shroud, if so equipped.
7. Remove the radiator mounting bolts.
8. Remove the radiator.
9. Install the replacement radiator and repeat steps 2 through 8 in reverse order.
10. After filling the cooling system and bringing it to normal operating temperature, pressure-test the system checking for leaks and proper coolant level.
11. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Replace core plugs (freeze plugs).*

Performance Objectives:

Given an operational engine with a malfunctioning core plug, necessary tools and equipment, the student will replace the core plug (freeze plug), according to the manufacturer's recommendations.

Evaluation Criterion:

The student will replace the malfunctioning core plug in the engine, to the satisfaction of the instructor.

Performance Guide:

1. Determine which core plug is in need of replacement.
2. If a visual check indicates the need to remove other parts for access to the core plug, check the manufacturer's service manual for removal procedures.
3. Using the appropriate tool, remove the core plug.
4. Clean in and around the core plug hole.
5. Using the proper tool, install the core plug.
6. Fill the cooling system to the required level with the proper coolant.
7. Pressure-test the system for leaks.
8. Run the engine to a normal operating temperature and recheck the coolant level.
9. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Replace heater hoses.*

Performance Objectives:

Given an automobile with defective heater hoses, necessary tools, equipment and service manual the student will identify the defective heater hoses and replace them, according to the manufacturer's recommendations.

Evaluation Criterion:

The student will identify and replace the defective heater hoses, to the satisfaction of the instructor.

Performance Guide:

1. Drain the cooling system below the heater hose level.
2. Remove the hose clamps at each end of the identified, defective hoses.
3. Grasp the hose at the connecting point and, with a twisting motion, remove the hose from the connection. NOTE: In some cases, it may be necessary to split or cut the hose with a knife in order to remove the hose.
4. Make sure that all connecting points are clean and free from any foreign material such as old hose or gasket sealer.
5. Install new hoses using new hose clamps where needed.
6. Fill the cooling system with coolant bringing it to the proper level.
7. Bleed the heater and hoses: Disconnect the top-most heater hose at its highest point and allow the coolant to flow through both disconnected points.
8. Bring the system to a normal operating temperature and pressure-test the system checking for leaks and proper operation.
9. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Replace radiator hoses.*

Performance Objectives:

Given necessary tools, the student will inspect and replace the upper and lower radiator hoses on a given engine, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will inspect and replace the upper and lower hoses on the given vehicle, to the satisfaction of the instructor.

Performance Guide:

1. Remove any parts that may be needed for access to the radiator hoses.
2. Remove the upper and lower radiator hoses: If necessary, cut the old hoses to prevent any damage to the radiator outlets.
3. Clean the water outlet connections to assure a watertight fit.
4. Install new hoses making sure that they are properly located before tightening the clamps.
5. Fill the cooling system to the required level with the proper coolant.
6. Pressure-test the cooling system for coolant leaks.
7. Run the engine to the normal operating temperature, and recheck coolant level.
8. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Replace variable-speed fan.*

Performance Objectives:

Given the necessary tools, equipment and service manual, the student will replace the variable-speed fan on the given vehicle, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the variable-speed fan, to the satisfaction of the instructor.

Performance Guide:

1. Remove any parts such as the shroud to obtain access to the fan assembly.
2. Loosen the alternator tension bolt to take the tension off the fan belt.
3. Remove the fan assembly mounting bolts and remove the fan assembly.
4. Install a new fan assembly, following steps 1 through 3 in reverse order.
5. Check the new fan for proper operation.
6. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Replace water pump.*

Performance Objectives:

Given a liquid-cooled engine, the necessary tools, equipment, and service manual, the student will replace the water pump, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the water pump to the satisfaction of the instructor.

Performance Guide:

1. Drain the cooling system.
2. Remove any components such as air conditioner, alternator, and even the radiator, if necessary, for access to the water pump.
3. Disconnect the lower radiator hose at the water pump.
4. Remove the fan assembly and the fan pulley.
5. Disconnect the water pump bypass hose from the water. pump, if necessary.
6. Remove the water pump.
7. Clean the block surfaces of all old gasket materials.
8. Install a new water pump using a new gasket, following steps 2 through 6 in reverse order.
9. After filling the cooling system, pressure-test the system by bringing it up to the normal operating temperature.
10. Check for the proper coolant level, leaks or stoppage.
11. Have the instructor check your work.

AUTOMOTIVE MECHANICS

X. HEATERS

Tasks* covered by Mechanics Helpers:

1. Replace defroster hose.

DUTY: HEATERS

TASK: Replace defroster hose.*

Performance Objectives:

Given an operational heating system with a defective defroster hose, the student will replace the defroster hose, according to the manufacturer's service procedures.

Evaluation Criterion:

The student will find the defective hose and replace it with a new one, to the satisfaction of the instructor.

Performance Guide:

1. Locate the defective defroster hose.
2. Remove the retaining clamps from the defective hose.
3. Remove the hose from the fittings.
4. Place the new hose over the fittings and connect by pushing the hose into the fittings.
5. Put the retaining clamps around the hose to clamp it to the fittings.
6. Turn the defroster on to check for leaks around the hose. There should be no leaks.
7. Have the instructor check your work.

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AUTOMOTIVE MECHANICS

(SERVICE MECHANIC)

MASAKO T. SHIN, CURRICULUM SPECIALIST, STC, SIU-C

The preparation of this multicultural series was aided financially through funding agreements with the Illinois State Board of Education/Department of Adult, Vocational and Technical Education.

(Contract Numbers: R-33-10-C-0442-400, R-33-21-J-0542-400)

June 1981

ARDEN L. PRATT, DEAN
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OUR GOAL

TO ACHIEVE THE MAXIMUM IN THE MINIMUM TIME

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INTRODUCTION

The Automotive Mechanics Program runs 36 weeks covering the repair-work areas of engine (4 weeks); drive trains - rear ends/drive shafts/manual transmission (4 weeks); carburetor (3 weeks); emission (3 weeks); ignition/tune-up (3 weeks); charging and starting (4 weeks); alignment (4 weeks); automatic transmission (4 weeks); brakes (4 weeks); and air conditioning and heating (3 weeks).

The class meets two hours each day in a related education class (a basic education program to improve the student's reading/English/mathematics skills necessary for vocational training and adequate performance at the entry level of employment) or in a GED class (to prepare for the General Education Development Test - a high school equivalency certification test), and six hours each day 5 days a week in the shop.

The student in the Automotive Mechanics Program will acquire the knowledge and skills required of a mechanics helper in all the repair areas. The student also will receive the additional training necessary to perform as a service mechanic with an option to concentrate in one or two repair areas and/or to perform as an automobile journeyman mechanic depending on his or her aptitude, interest and progress in class.

At the end of the training period, the student will be ready for job entry at the apprentice level.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Service Mechanic)

I. ENGINE OVERHAUL

1. Perform cylinder compression test.
2. Perform cylinder balance test.
3. Perform cylinder leakage test.
4. Disassemble engine.
5. Replace crankshaft and main bearings: inspect and correct the bearing fit; inspect the crankshaft and the connecting rod assembly.
6. Replace connecting rods and bearings.
7. Fit piston pins.
8. Grind valves.
9. Replace valves, valve guides and valve seals; resurface valve seats; service rocker arm assembly.
10. Inspect head for warp.
11. Diagnose valve train and head malfunctions.
12. Remove and replace oil pump.
13. Replace camshaft, camshaft bearings, timing gears, chains, gaskets, seals, and valve lifters.
14. Replace flywheel and flywheel ring gear.
15. Replace engine mounts.
16. Replace pistons, piston rings, gaskets and seals.
17. Adjust valves.
18. Perform operational inspections of positive engine lubrication systems.
19. Perform operational inspections of the positive crankcase ventilation system.

II. DRIVE TRAINS

1. Adjust external shift linkage on manual transmission.
2. Adjust clutch.
3. Rebuild overdrive unit.
4. Rebuild manual transmission.
5. Analyze and repair electrical control circuit and components for overdrive unit.
6. Diagnose differential malfunctions.
7. Repair hydraulic-type clutch.
8. Repair or replace differential.
9. Replace universal joints.
10. Replace front drive axle assemblies.
11. Repair and adjust front drive axle assemblies.
12. Replace mechanical-type clutch.
13. Replace pinion seal.
14. Replace pilot bearing.
15. Replace rear axle shaft, bearing and seal.

II. DRIVE TRAINS (cont.)

16. Replace speedometer drive gear.
17. Test manual transmission operation.
18. Replace clutch release bearings (throw-out bearings).

III. AUTOMATIC TRANSMISSION

1. Adjust floor linkage.
2. Adjust column-type linkage.
3. Adjust linkage from engine to automatic transmission.
4. Diagnose and adjust modulators.
5. Replace and adjust modulators.
6. Inspect and repair transmission cooling systems.
7. Inspect, remove and replace convertor.
8. Inspect and replace front pump, seal, and bushings.
9. Install automatic transmission cooler (external type).
10. Make band adjustments (internal or external).
11. Overhaul automatic transmission.
12. Perform operational tests on automatic transmission.
13. Remove and install automatic transmissions.
14. Adjust neutral safety switch.
15. Replace and adjust neutral safety switch.

IV. ELECTRICAL SYSTEMS

1. Analyze or adjust engine performance using engine analyzer.
2. Analyze cause of electrical fires.
3. Analyze malfunctions in the cranking system.
4. Inspect secondary circuit lead wires, distributor cap, and rotor. Measure resistance in secondary wires.
5. Inspect ignition switch, resistor, wiring, and coil of the primary circuit.
6. Replace coil of the primary circuit.
7. Repair or replace switches.
8. Replace ignition switch and resistor.
9. Set ignition timing.
10. Inspect points and condenser of the primary circuit.
11. Replace points and condenser.
12. Evaluate alternator/generator output.
13. Repair or replace charging system regulators.
14. Repair generators or alternators.
15. Replace generators and alternators.
16. Replace and adjust distributors.
17. Strobe distributor, and modify or correct advance curves.
18. Replace chassis and underhood wiring.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Service Mechanic)

IV. ELECTRICAL SYSTEMS (cont.)

19. Replace solenoids.
20. Repair starters.
21. Replace starters.
22. Repair or replace fuse box assembly.
23. Repair or replace lighting system components.
24. Replace flasher units.
25. Test and repair cruise control units.
26. Test and rewire dash units.
27. Inspect and test windshield wiper motors, blades, and arms.
28. Repair windshield wiper mechanisms and controls.
29. Test and repair transistor ignition systems.

V. CARBURETOR AND EMISSION

1. Learn about pollution control. (Theory only)
2. Learn P.C.V. crankcase emission control systems. (Theory only)
3. Know the basic P.C.V. engine modification. (Theory only)
4. Identify exhaust emission control systems. (Theory only)
5. Identify evaporative emission control systems. (Theory only)
6. Adjust infra-red machine.
7. Test for hydrocarbon and carbon monoxide level.
8. Adjust carburetor.
9. Repair or service carburetors.
10. Analyze for moisture or foreign particle level in fuel system.
11. Adjust choke unit, (Automatic and manual).
12. Inspect, clean and adjust choke unit (automatic and manual).
13. Replace gas tank sending unit.
14. Measure fuel flow and pressure.
15. Perform operational inspections of exhaust emission control system.
16. Perform operational inspections of evaporative emission control system.
17. Service or repair manifold heat and controls.
18. Remove and replace fuel pump.
19. Repair or replace fuel lines and hoses.

VI. STANDARD AND POWER STEERING

1. Adjust worm and sector in steering gear.
2. Replace steering spindles.

VI. STANDARD AND POWER STEERING (cont.)

3. Inspect steering gear.
4. Inspect steering linkage.
5. Lubricate steering gear and linkage.
6. Adjust power steering units. Check power steering fluid level.
7. Rebuild power steering units.
8. Repair power steering pumps.
9. Replace power steering pumps.
10. Replace manual steering linkage components.
11. Replace manual steering gear components.
12. Replace power steering components.
13. Replace filter in power steering.

VII. BRAKING SYSTEMS

1. Arc grind brake shoes.
2. Adjust parking brake linkage.
3. Adjust hand brake external band.
4. Replace hand brake external band.
5. Free-up parking brake cables.
6. Inspect and replace brake pads (disc brakes).
7. Inspect and turn rotor (disc brakes).
8. Inspect and refinish brake drums.
9. Inspect and replace self-adjusters.
10. Perform operational brake inspection.
11. Recondition backing plates.
12. Repair disc brake calipers.
13. Repair master cylinder.
14. Replace master cylinder.
15. Rebuild brake power units.
16. Repair self-adjuster.
17. Repair wheel cylinder.
18. Replace wheel cylinder.
19. Replace brake shoes.
20. Replace hydraulic control valves.
21. Replace hydraulic brake power units.
22. Replace hydraulic power cylinder.
23. Replace parking brake linkage.

VIII. FRONT ENDS

1. Adjust torsion bars.
2. Replace torsion bars.
3. Adjust front wheel bearing. Inspect wheel bearings.
4. Balance wheels and tires.

VIII. FRONT ENDS (cont.)

5. Check and align front end.
6. Inspect and replace steering damper.
7. Perform visual inspections of the suspension systems.
8. Inspect and repair front suspension systems.
9. Rebush king pins or link pins.
10. Repair rear suspension systems.
11. Replace ball joints.
12. Replace front wheel bearing grease seal.
13. Replace front suspension control arms and bushings.
14. Replace rear suspension systems.

IX. COOLING SYSTEMS

1. Check coolant temperature.
2. Check overflow tank.
3. Chemically clean and flush cooling system.
4. Perform chemical test on cooling systems.
5. Pressure-test cooling system.
6. Solder minor leaks in radiators.
7. Test thermostat.
8. Replace thermostat.

X. HEATERS

1. Diagnose heating system malfunctions.
2. Replace heater control units.
3. Remove and replace heater core.
4. Repair heater core.
5. Service heater control components.

XI. AUTOMOBILE AIR CONDITIONERS

1. Install air conditioners in vehicles.
2. Diagnose malfunctions in air conditioning.
3. Evacuate air conditioning system.
4. Inspect and recharge system with refrigerant.
5. Pressure-test system.
6. Leak-test system.
7. Repair air conditioning compressor.
8. Replace air conditioning compressor.
9. Repair electrical circuits.
10. Repair vacuum circuits.
11. Replace condenser in air conditioning unit.
12. Replace compressor seals.
13. Replace air conditioner fan motor.

XI. AUTOMOBILE AIR CONDITIONERS (cont.)

14. Replace evaporator in air conditioning unit.
15. Replace drier in air conditioning unit.
16. Replace expansion valve in air conditioning units.
17. Replace evaporator control valve or diaphragm in air conditioning unit.
18. Service air conditioner control cables.
19. Repair automatic air conditioning and heater systems.

AUTOMOTIVE MECHANICS

I. ENGINE OVERHAUL (Service Mechanic)

Tasks covered in addition to those listed for mechanics helpers.

1. Perform cylinder compression test.
2. Perform cylinder balance test.
3. Perform cylinder leakage test.
4. Disassemble engine.
5. Replace crankshaft and main bearings: inspect and correct the bearing fit; inspect the crankshaft and the connecting rod assembly.
6. Replace connecting rods and bearings.
7. Fit piston pins.
8. Grind valves.
9. Replace valves, valve guides and valve seals; resurface valve seats; service rocker arm assembly.
10. Inspect head for warp.
11. Diagnose valve train and head malfunctions.
12. Remove and replace oil pump.
13. Replace camshaft, camshaft bearings, timing gears, chains, gaskets, seals, and valve lifters.
14. Replace flywheel and flywheel ring gear.
15. Replace engine mounts.
16. Replace pistons, piston rings, gaskets and seals.
17. Adjust valves.
18. Perform operational inspections of positive engine lubrication systems.
19. Perform operational inspections of the positive crankcase ventilation system.

DUTY: ENGINE OVERHAUL

TASK: Perform cylinder compression test.

Performance Objectives:

Given an engine operating at normal temperature, the necessary tools, gauges and service manual, the student will perform a cylinder compression test.

Evaluation Criterion:

The student will perform a cylinder compression test within ± 10 p.s.i. of the instructor's readings.

Performance Guide:

1. Remove all the spark plugs.
2. Remove the coil secondary wire and ground to the engine.
3. Fix the throttle in wide-open position.
4. Install the compression gauge and turn the engine over a minimum of four times. Note the readings.
5. Repeat for each cylinder.
6. Reinstall the spark plugs, spark plug wires and coil secondary wire. (Close the throttle.)
7. If the readings are not within the specifications, do a wet compression test.
    a. Squirt a few drops of oil in each cylinder and repeat the same steps for the compression test above.
    b. If the compression rises, bad rings; if the compression stays same, bad valves.
8. Check your findings with the instructor.

DUTY: ENGINE OVERHAUL

TASK: Perform cylinder balance test.

Performance Objectives:

Given an engine at normal operating temperatures, the necessary test equipment and service manual, the student will perform a cylinder balance test.

Evaluation Criterion:

The student will perform a cylinder balance test within ± 10% of the instructor's readings.

Performance Guide:

1. Connect a cylinder balance tester to the engine according to the instrument manual.
2. Adjust the engine r.p.m. to the recommended speed.
3. Short-out one cylinder at a time with the short-out switches on the balance tester.
4. Record the r.p.m. for each cylinder.
5. If the drop varies in the r.p.m. between the cylinders, then a problem may exist within the cylinder.
6. Determine if the drop in the r.p.m. is due to piston-ring or valve trouble.
7. Have the instructor check your findings.

DUTY: ENGINE OVERHAUL

TASK: Perform cylinder leakage test.

Performance Objectives:

Given an engine at normal operating temperatures, the necessary tools, equipment and service manual, the student will perform a cylinder leakage test following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will perform a cylinder leakage test within ± 10% of the instructor's readings.

Performance Guide:

1. Remove the spark plugs, air cleaner, crankcase oil filler cap and radiator cap.
2. Set the throttle to the wide-open position.
3. Determine the top dead-center position of the number one cylinder and all others.
4. Connect a compression tester to the number one cylinder.
5. Disconnect the coil secondary wire and ground to the engine.
6. Apply air pressure to the cylinder under test.
7. Check the level of percentage of the air leakage on the gauge.
8. Listen to the carburetor, radiator, and tailpipe for air noises.
9. Determine whether the leakage is in the intake valve, exhaust valve, head gasket or cylinder head.
10. Repeat the test for each successive cylinder.
11. Have the instructor check your findings.

DUTY: ENGINE OVERHAUL

TASK: Disassemble engine.

Performance Objectives:

Given an engine removed from the vehicle, the necessary tools and service manual, the student will remove all accessories, disassemble the engine and internal components without causing any damages to the parts.

Evaluation Criterion:

The student will disassemble the engine and remove all the accessories and internal components to the satisfaction of the instructor.

Performance Guide:

1. Drain the crankcase.
2. Remove the distributor.
3. Remove the starter, alternator and any other components that may be attached around the outside of the engine.
4. Remove the intake manifold.
5. Remove the pushrods. In some cases, it may be necessary to remove the rocker-arms first.
6. Remove the cylinder heads.
7. Remove the oil pan.
8. Remove the oil pump assembly.
9. Remove the connecting rod assemblies and pistons, marking them properly.
10. Remove the harmonic balancer and timing cover assembly.
11. Remove the timing gear and chain.
12. Remove the flywheel.
13. Remove the crankshaft and camshaft.
14. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Replace crankshaft and main bearings: inspect and correct the bearing fit; inspect the crankshaft and the connecting rod assembly.

Performance Objectives:

Given a crankshaft and block assembly, the necessary tools, equipment and service manual, the student will replace the crankshaft and main bearings according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the crankshaft and main bearings in the engine to the satisfaction of the instructor.

Performance Guide:

1. Mike the crankshaft and record the readings.
2. Inspect the bearing saddles in the block to determine that all galleries are clean and blown free of dirt.
3. Inspect the new bearings and make sure the size is correct for the replacement.
4. Install the upper bearing in the proper place.
5. Lubricate the top half of the bearings with engine oil or other appropriate lubricant.
6. Install the rear main bearing seal.
7. Put the crankshaft in place. Make sure the crankshaft is clean and all oil holes have been blown out.
8. Rotate the crankshaft back and forth to make sure no binding is occurring.
9. Install the bearings in the lower caps and lubricate generously.
10. Install the bearing in the engine block.
11. Tighten the connecting rod caps to the torque specifications in correct sequential order.
12. Turn the crankshaft after each bearing has been torqued to insure a proper functioning.
    CAUTION: Do not turn the crankshaft with plastigauge installed.

DUTY: ENGINE OVERHAUL

TASK: Replace crankshaft and main bearings: inspect and correct the bearing fit; inspect the crankshaft and the connecting rod assembly.

Performance Guide (cont.):

13. Check the connecting rod side clearance and crankshaft end play.
14. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Replace connecting rods and bearings.

Performance Objectives:

Given the necessary tools and service manual, the student will remove and replace the connecting rods and rod bearings in a given engine.

Evaluation Criterion:

The student will remove and replace the connecting rods and rod bearings in the engine to the satisfaction of the instructor.

Upon completion of the work, there will be no leaks in the repaired area, and the oil pressure and engine temperatures will conform to the manufacturer's specifications.

Performance Guide:

1. Remove the cylinder heads.
2. Remove the oil pan.
3. Ridge-ream the cylinder.
4. Remove the rod nuts and caps.
5. Remove the piston and rod assembly. Mark pistons properly to insure correct reinstallation.
6. Clean and inspect the cylinder walls.
7. Gauge the cylinders for wear and taper using inside micrometers or cylinder bore gauge.
8. Deglaze the cylinder with hone.
9. Mike the crankshaft journals for wear and out-of round. Take both high and low readings.
10. Remove the piston rings.
11. Clean the ring grooms, and inspect the piston for wear and cracks, lands and grooves for signs of wear.
12. Check the wrist pins for looseness, and align the rod and piston.
13. Check the rings for proper ring gap.
14. Install the rings in proper grooves with the proper side up.
15. Lubricate the rings generously and install the ring compressor.

DUTY: ENGINE OVERHAUL

TASK: Replace connecting rods and bearings.

Performance Guide: (cont.)

16. Install the bearings: insert-in the rod and cap observing oil holes for alignment.
17. Install the connecting rod assembly in the engine block.
18. Check for clearance with plastigauge or feeler gauge.
19. Retorque the connecting rods.
    a. Rotate the crank after each connecting rod has been installed.
    b. Crank should turn freely allowing for a slight drag of the new rings.
20. Install the oil pan.
21. Install the cylinder heads.
22. Fill the crankcase with correct grade and weight of oil.
23. Fill the radiator with coolant.
24. Start the engine; check oil pressures and engine temperature; examine for leaks.
25. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Fit piston pins.

Performance Objectives:

Given the necessary tools, equipment, service manual and the piston assemblies, the student will fit the piston pins following the manufacturer's specifications.

Evaluation Criterion:

The student will fit the piston pins to the satisfaction of the instructor.

The piston will move freely without binding.

Performance Guide:

1. Remove the old piston pins and bushings.
2. Install new bushings if needed.
3. Hone bushings to the manufacturer's specifications.
4. Install new pins and locks.
5. Align the rod and piston.
6. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Grind valves.

Performance Objectives:

Given the intake and exhaust valves, the necessary valve grinding equipment and service manual, the student will reface the valves following the manufacturer's specifications.

Evaluation Criterion:

The student will reface the valves to the satisfaction of the instructor.

The face of the valves must fit flush with the valve seat after grinding.

Performance Guide:

1. Clean the valves, and inspect for stem wear and warpage.
2. Set the valve grinding machine to a proper angle.
3. Dress the stone.
4. Invert the valve and check for the run out.
5. Grind the valve face.
6. Feed at a proper rate.
7. Move the valve across the stone, making sure that the valve does not leave the stone and the entire stone surface used.
8. Check if enough face is left and the stem is true.
9. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Replace valves, valve guides and valve seals; resurface valve seats; service rocker arm assembly.

Performance Objectives:

Given an engine with defective valves and valve guides, the necessary tools, equipment and service manual, the student will perform a valve job according to the manufacturer's specifications.

Evaluation Criterion:

The student will perform a valve job on the engine to the satisfaction of the instructor.

When the valve job is completed, the replaced parts will function without leaks, binds or noises.

Performance Guide:

NOTE: In most instances, a valve job will require reconditioning of the valves and valve guides.
This performance objective involves only the removal and replacement of the valves and valve guides.

1. Drain the cooling system, and disconnect the upper radiator hose from the engine.
2. Remove the air cleaner, and disconnect the accelerator rod, fuel lines and vacuum hoses from the carburetor.
3. Remove or move aside the lines and hoses, as is necessary to get at the cylinder head.
4. Disconnect sparkplug wires and temperature-sending-unit wire.
5. Remove the crankcase ventilating system. Remove the air-supply-tube assembly.
   On the engine equipped with an air-conditioner, remove the compressor, but do not disconnect the air-conditioner hoses.
6. On many in-line engines, it is not necessary to remove the manifolds. But on the V-8 engines, the carburetor and intake manifold must be removed.

DUTY: ENGINE OVERHAUL

TASK: Replace valves, valve guides and valve seals; resurface valve seats; service rocker arm assembly.

Performance Guide (cont.):

7. Remove the rocker arm cover or covers.
8. On engines with ball-stud-supported rocker arms, rocker arms and pushrods can be removed at this time. If they are left on, nuts should be loosened so the rocker arms can be moved aside and pushrods removed.
   The pushrods should be placed in a rack in proper sequence so they can be put back into the same spot from where they are removed.
9. On engines with rocker arms supported on the shafts, remove the shaft assembly or assemblies, and then remove pushrods in sequence.
10. Remove the head bolts and take the head off the engine.
11. Remove the valve and springs from the head keeping them in proper sequence.
12. Check the valves and valve seats.
    a. Grind the seats and reface the valves if necessary.
    b. Check the valve seating.
    c. Touch up the valve stem ends if necessary.
13. Check the valve guides for wear. Clean, replace, or ream for larger guides as necessary.
14. Replace the valves and springs in head.
    Put new valve seals on the valves.
15. Install new head gasket.
16. Install head, pushrods, rocker arms, rocker arm cover, and other parts removed during the head removal.
17. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Inspect head for warp.

Performance Objectives:

Given a cylinder head, the necessary equipment and service manual, the student will inspect the head for warpage and identify the necessary repairs for the warpage.

Evaluation Criterion:

The student will inspect the cylinder head, identify any warpage, and determine the necessary repairs to the satisfaction of the instructor.

Performance Guide:

1. Clean the cylinder head thoroughly.
2. Check for burrs, rough spots, cracks and/or pits.
3. Place a long straight edge against the sealing surface of the head.
   a. Diagonally from corner to corner.
   b. Horizontally along the entire length.
4. Measure any open spaces with a feeler gauge, and refer to the manufacturer's specifications for the tolerances.
5. If warpage exists, determine the necessary repairs.
6. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Diagnose valve train and head malfunctions.

Performance Objectives:

Given the necessary tools and equipment, the student will examine the valve train and the head of an operating engine and identify the malfunctions.

Evaluation Criterion:

The student will identify the malfunctions in the valve train and/or head to the satisfaction of the instructor.

Performance Guide:

1. Remove the rocker arm covers.
2. While the engine is running, visually inspect the valve stems, push rods and rocker arms for proper operation.
3. Using a feeler gauge or dial indicator, check the intake and exhaust valves for proper clearance and timing, according to the manufacturer's specifications.
4. Remove the spark plugs according to the manufacturer's recommendations.
5. Check for weak compression caused by weak, worn or faulty piston rings.
6. Once the dry compression test is done to determine whether the bad compression is due to faulty piston rings or valves, do a wet compression test by adding a few drops of oil to the cylinder and by rating the compression test.
7. If the compression rises, faulty rings; if no rise, bad valves.
8. Have the instructor check your findings.

DUTY: ENGINE OVERHAUL

TASK: Remove and replace oil pump.

Performance Objectives:

Given an engine, the necessary tools, equipment and service manual, the student will replace the oil pump, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will remove the old pump and replace it with a new one to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle and place the safety stands under the frame.
2. Drain oil from the oil pan.
3. Remove oil pan, following the manufacturer's guide.
4. Remove and examine the oil pump to determine the reasons for failure before replacing with a new pump.
5. An oil pump may be bolted to the side of the block. Check the manufacturer's service manual for the proper location of the oil pump on the given engine.
6. Replace a new pump following Steps 2 through 4 in the reverse order.
7. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Replace camshaft, camshaft bearings, timing gears, chains, gaskets, seals, and valve lifters.

Performance Objectives:

Given an engine, the necessary tools, equipment and service manual, the student will remove and replace the camshaft and the related components, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the camshaft and the related components to the satisfaction of the instructor.

Upon completion of the repairs, the camshaft and the component parts will work freely without binding or leakage.

Performance Guide:

1. Remove the front timing cover and the fuel pump.
   a. To remove the front timing cover, it may be necessary to remove the water pump and any brackets that are supporting the alternator or the air conditioner.
   b. It may also be necessary to remove the harmonic balancer on the crankshaft by bolting a special puller on the harmonic balancer and pulling it off.
2. Remove the timing chain and gears.
3. Remove the push rods and rocker arm assembly.
4. Remove the valve lifters.
5. Remove the camshaft.
6. Remove the cam bearings, and observe the position of oil feed holes.
7. Remove the expansion plugs.
8. Clean the oil passages.
9. Install the cam bearings in their respective positions, being careful to line up the oil holes.
10. Install the camshaft, making sure the cam turns freely.
11. Install the timing, chain, sprockets, seals, gaskets, and timing cover.

DUTY: ENGINE OVERHAUL

TASK: Replace camshaft, camshaft bearings, timing gears, chains, gaskets, seals, and valve lifters.

Performance Guide (cont.):

12. Install the new lifters, push rods and rocker assembly.
13. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Replace flywheel and flywheel ring gear.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and service manual, the student will replace the flywheel ring gear and flywheel, following the manufacturer's specifications.

Evaluation Criterion:

The student will remove and replace the flywheel ring gear and flywheel to the satisfaction of the instructor.

When completed, the flywheel ring gear will function without noise or slippage.

Performance Guide:

1. Raise the vehicle, and place the safety stands under the frame.
2. Remove the drive line.
3. Remove the transmission and bell housing.
4. Remove the clutch assembly or torque convertor.
5. Scribe the position of the flywheel on the crankshaft.
6. Remove the flywheel bolts.
7. Remove the flywheel.
8. Remove the flywheel ring gear.
   The flywheel ring gear may have to be heated.
   When heated, it will drop off.
9. Install a new ring.
   a. Heat and then place the new ring gear on the flywheel.
   b. When the flywheel ring gear cools, it will shrink onto the flywheel.
10. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Replace engine mounts.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and service manual, the student will replace the engine mounts following the manufacturer's recommendations.

Evaluation Criterion:

The student will remove and replace the engine mounts to meet the manufacturer's specifications.

Performance Guide:

1. Refer to the manufacturer's service manual for the proper procedures for the given vehicle.
2. Support the engine weight with hydraulic jacks or stands to remove the load from the engine mounts.
3. Unbolt and remove the old engine mounts.
4. Install new engine mounts, and lower the engine to the original position.
5. Torque the engine mount bolts to the specifications.
6. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Replace pistons, piston rings, gaskets and seals.

Performance Objectives:

Given an engine with a cracked piston, the necessary tools and service manual, the student will remove and replace the cracked piston, according to the manufacturer's specifications.

Evaluation Criterion:

The student will remove and replace the piston to the satisfaction of the instructor.

Upon completion, the repaired engine will operate without leaks or excessive noise.

Performance Guide:

1. Remove the cylinder heads and oil pan.
2. Ridge-ream the cylinders.
3. Remove the rod nuts and caps.
4. Remove the piston and rod assembly, marking each rod and cap to identify its proper location.
5. Clean and inspect the cylinder walls; check for wear and taper using a micrometer or cylinder bore gauge.
6. Deglaze the cylinder walls using a hone.
7. Check the crankshaft journals for wear and out-of-round: Take the high and low readings.
8. Replace the pistons, checking the wrist pins for looseness, and align pistons and rod.
9. Check the piston rings in the cylinder for proper gear gap.
10. Install rings on the piston, checking for proper placement or correct grooves.
11. Lubricate the rings generously, and install pistons into the cylinders, using a ring compressor.
12. Make sure the connecting rods are returned to the proper crank journals and pistons are facing in correct direction.
13. Reinstall the connecting rod caps, according to the manufacturer's specifications.
14. Reassemble the engine components.

DUTY: ENGINE OVERHAUL

TASK: Replace pistons, piston rings, gaskets and seals.

Performance Guide (cont.):

15. Fill the crankcase with the proper amount and type of oil.
16. Fill the cooling system with coolant.
17. Start the engine: Check for oil leaks, oil pressures and correct operating temperature, according to the manufacturer's specifications.
18. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Adjust valves.

Performance Objectives:

Given an engine, the necessary tools, equipment and service manual, adjust the intake and exhaust the valves according to the specifications, following the manufacturer's recommendations.

Evaluation Criterion:

The student will adjust the intake and exhaust valves to the proper specifications.

Upon completion of the adjustments, the valves must move freely when turned by hand.

Performance Guide:

1. Run the engine until it reaches the normal operating temperature.
2. Remove the rocker arm covers.
3. Using the shop manual, find the specification and proper sequence to adjust the valves for the given engine.
4. Using a proper feeler gauge, adjust each intake and exhaust valve to the desired specifications.
5. Replace the rocker arm cover and gasket.
6. Have the instructor check your work.

DUTY: ENGINE OVERHAUL

TASK: Perform operational inspections of positive engine lubrication systems.

Performance Objectives:

Given a vehicle, service manual, tools and gauges, the student will perform operational inspections of the engine lubrication systems, following the manufacturer's recommendations.

Evaluation Criterion:

The student will locate the problems and identify the necessary repairs to correct the problems, to the satisfaction of the instructor.

Performance Guide:

1. Check the manufacturer's service manual for the specifications and the recommended procedures.
2. Check the oil pump for wear and operation. Check the oil pump screen.
3. Check the filter mounting for defects and clogged passageways.
4. Using air and suitable rods, check the crankshaft and block for open and clean passages.
5. Check oil passages in the cylinder head leading to the rocker arm area, using air and suitable rods.
6. Have the instructor check your findings.

DUTY: ENGINE OVERHAUL

TASK: Perform operational inspections of the positive crankcase ventilation system.

Performance Objectives:

Given an engine, the necessary tools, equipment and service manual, the student will perform operational inspections of the positive crankcase ventilation system, following the manufacturer's recommendations.

Evaluation Criterion:

The student will perform operational inspections of the positive crankcase ventilation system and report any malfunctions to the instructor.

Performance Guide:

1. Check the vacuum hoses for leaks and cracks.
2. Check the source of vacuum for obstructions in fittings.
3. Using a service manual, check the P.C.V. valve: Clean or replace if not up to the manufacturer's specifications.
4. Have the instructor check your work.

II. DRIVE TRAINS (Service Mechanic)

Tasks covered in addition to those listed for mechanics helpers.

1. Adjust external shift linkage on manual transmission.
2. Adjust clutch.
3. Rebuild overdrive unit.
4. Rebuild manual transmission.
5. Analyze and repair electrical control circuit and components for overdrive unit.
6. Diagnose differential malfunctions.
7. Repair hydraulic-type clutch.
8. Repair or replace differential.
9. Replace universal joints.
10. Replace front drive axle assemblies.
11. Repair and adjust front drive axle assemblies.
12. Replace mechanical-type clutch.
13. Replace pinion seal.
14. Replace pilot bearing.
15. Replace rear axle shaft, bearing and seal.
16. Replace speedometer drive gear.
17. Test manual transmission operation.
18. Replace clutch release bearings (throw-out bearings).

DUTY: DRIVE TRAINS

TASK: Adjust external shift linkage on manual transmission.

Performance Objectives:

Given a vehicle with manual transmission, the necessary tools, equipment and service manual, the student will adjust the external shift linkage on the manual transmission to meet the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the external shift linkage on the transmission to the satisfaction of the instructor.

Performance Guide:

1. All safety procedures must be followed.
2. Raise the hood and inspect the linkage visually: On certain vehicles, adjustments are on the steering column; on others, the transmission.
3. If on the column, place the transmission in neutral, loosen the clamps on the linkage and adjust to the manufacturer's specifications.
4. Retighten the clamps, and test for the operation.
5. If on the transmission, jack up the vehicle and place the safety stands under the frame.
6. Place the transmission in neutral, loosen the linkage clamps, adjust to the manufacturer's specifications and retighten the clamps.
7. Test for the operation, and repeat the process if the linkage is still too loose or tight.
8. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Adjust clutch.

Performance Objectives:

Given a vehicle with standard transmission, the necessary tools, equipment, service manual, the student will adjust the clutch to meet the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the clutch to the satisfaction of the instructor.

Upon completion, the clutch will not have excessive noise when engaged, and it will not slip, drag, or pulsate the pedal.

Performance Guide:

1. Place the transmission shift lever in neutral.
2. Check the clutch linkage for the proper adjustment.
    a. If necessary, lubricate, align, and adjust linkage.
3. Check for worn or loose transmission mounts.
4. Check the universal joints for wear or looseness.
5. Check attaching bolts on the clutch pressure plate, transmission and clutch housing.
6. Check freedom of movement of the clutch release bearings, and free up or replace as necessary.
7. Adjust the clutch as necessary.
8. Refer to the manufacturer's specification for the proper repair sequence after the repair needs have been determined:
    a. Check for oil or grease on the flywheel, friction disc or pressure plate.
    b. Examine the clutch pressure plate and the cover plate assembly for cracks or heat discoloration.
    c. Check the pressure plate and flywheel for warpage.
9. Have the instructor check your adjustment.

DUTY: DRIVE TRAINS

TASK: Rebuild overdrive unit.

Performance Objectives:

Given an overdrive transmission with known defects and the service manual, the student will disassemble, repair, and rebuild the overdrive unit following the manufacturer's specifications.

Evaluation Criterion:

The student will disassemble, repair and rebuild the transmission to the satisfaction of the instructor.

Performance Guide:

1. Remove the companion flange and governor.
2. Drive out the shifter shaft; locate the pin and pull the shaft out as far as possible to clean the shift nail.
3. Remove the overdrive housing and top end of the shaft to prevent it from coming off with the housing. Inside parts now can be removed.
4. Leave one screw in the adapter plate to hold it to the transmission case, and remove the overdrive shaft.
   a. Make sure to catch rollers from the wheeling unit.
   b. Remove the snap ring and gears from the shaft.
5. Remove the retaining clip, free wheel unit and the pinion cage.
6. Separate the pinion cage from the free wheel unit by removing the retaining clip.
7. Remove the overdrive sun gear and the shift nail.
8. Remove the snap ring from the adapter plate; remove the sun gear cover plate, balk ring, and solenoid pawl.
9. Inspect all parts and replace or repair any defective parts.
10. Reassemble the overdrive unit by reversing the disassembly procedures.
11. Have the instructor check your procedures.

DUTY: DRIVE TRAINS

TASK: Rebuild manual transmission.

Performance Objectives:

Given a standard transmission with defects, the necessary tools, equipment and service manual, the student will disassemble and repair the defective components of the transmission to meet the manufacturer's specifications.

Evaluation Criterion:

The student will overhaul the transmission to correct all malfunctions to the satisfaction of the instructor.

Performance Guide:

1. Locate the manufacturer's specifications on the given transmission.
2. Remove the transmission cover and inspect all visible gears, synchronizers and spacers.
3. Following the manufacturer's disassembly procedures, disassemble the transmission and check the parts for nicks, burrs or broken gear teeth.
4. Check the cluster gear for correct thickness spacers with a caliper micrometer against the manufacturer's recommended thickness.
5. Check all other components in the transmission for wear, leaks, or other problems
6. When the problem is located, repair the malfunction.
7. Make sure the cause of the malfunction is corrected and the defective parts are replaced.
8. Reassemble the transmission and test it for proper functioning.

DUTY: DRIVE TRAINS

TASK: Analyze and repair the electrical control circuit and components for an overdrive unit.

Performance Objectives:

Given an automobile with an overdrive transmission with a defect in the electrical control circuit, the necessary tools, equipment and service manual, the student will identify the defect and make the repairs necessary to meet the manufacturer's specifications.

Evaluation Criterion:

The student will identify the problem in the electrical control circuit to the satisfaction of the instructor.

Performance Guide:

1. Locate the wiring diagram in the service manual for the vehicle.
2. Check all the electrical connections.
3. Follow the manufacturer's test procedure until the defect is located.
4. Repair the defect.
5. Road-test the car and check for the operation of overdrive.
6. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Diagnose differential malfunctions.

Performance Objectives:

Given a vehicle with a known differential defect and the service manual, the student will identify the malfunctions and report the findings to the instructor.

Evaluation Criterion:

The student will locate the malfunctions and report the findings to the instructor.

The student must recognize all the malfunctions identified by the instructor.

Performance Guide:

1. Raise the vehicle from the floor.
2. Drain the differential.
3. Remove the rear tires and wheels.
4. Remove the rear brake drums.
5. Remove all backing plate bolts.
6. Remove the rear axle.
7. Remove the drive shaft with joint at the differential.
8. Remove the bolt or nut holding the carrier assembly to the axle housing.
9. Remove the carrier assembly.
10. Clean the carrier assembly.
11. Mark the adjusting caps and nuts for identification.
12. Remove the adjusting cap bolt.
13. Remove the ring gear and carrier assembly by lifting them out of the housing.
14. Remove the pinion nut.
15. Remove the yoke from the pinion shaft.
16. Remove the pinion seal.
17. Remove the pinion and pinion bearings.
18. Remove the axle gears and spider gears.
19. Clean all parts.
20 Inspect all components and identify the damaged parts.
21. Report your findings to the instructor.

DUTY: DRIVE TRAINS

TASK: Repair hydraulic-type clutch.

Performance Objectives:

Given an automobile with malfunctioning hydraulic-type clutch, the necessary tools, equipment and service manual, the student will repair the clutch following the manufacturer's specifications.

Evaluation Criterion:

The student will identify the problem and make the necessary repairs on the hydraulic-type clutch to the satisfaction of the instructor.

Upon the completion of the repair, the clutch will operate without slippage, sticking or excessive noise.

Performance Guide:

1. Determine whether the clutch master cylinder or the slave cylinder is defective.
2. Remove the defective unit, and repair or replace according to the manufacturer's specifications.
3. Adjust the slave cylinder linkage for the correct clutch adjustment after bleeding the system of air.
4. Check the clutch release mechanism for the proper operation, according to the manufacturer's specifications.
5. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Repair or replace differential.

Performance Objectives:

Given an automobile with a defect in the differential, the necessary tools, equipment and service manual, the student will repair the defective parts (or replace, if necessary), according to the manufacturer's specifications.

Evaluation Criterion:

The student will make the necessary repairs to correct the problem in the differential to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor.
2. Drain the differential.
3. Remove the rear tires and wheels.
4. Remove the rear brake drums.
5. Remove all backing plate bolts.
6. Remove the rear axle.
7. Remove the drive shaft with joint at the differential.
8. Remove the bolt or nut holding the carrier assembly to the axle housing.
9. Remove the carrier assembly from the axle housing.
10. Clean the carrier assembly.
11. Mark the adjusting caps and nuts for identification.
12. Remove the adjusting cap bolts.
13. Remove the ring gear and carrier assembly by lifting them out of the housing.
14. Remove the pinion nut.
15. Remove the yoke from the pinion shaft.
16. Remove the pinion seal.
17. Remove the pinion and pinion bearings.
18. Remove the axle gears and spider gears.
19. Replace the rear bearing on the pinion shaft.
20. Install the pinion shaft in the housing; install the outer or front bearing and yoke.
21. Preload the bearings with new crush rings, to the manufacturer's specifications.

DUTY: DRIVE TRAINS

TASK: Repair or replace differential.

Performance Guide: (cont.)

22. Remove the yoke. Install the pinion seal.
23. Assemble the ring gear, spider and axle gears.
24. Install the assembly in the carrier, making sure the adjusting caps and nuts are on the right side of the mark.*
    *When installing the ring gear, make sure the marks are lined up if the differential is the type with timing marks.
25. Adjust the ring gear and the pinion backlash to the manufacturer's specifications. Use whitelead on the ring and pinion to check the pattern by rotating the ring gear both ways several times.
26. Install the carrier in the differential housing.
27. Install both axles, brake drums and wheels.
28. Install the drive shaft.
29. Fill the differential with proper lubrication.
30. Start the vehicle and perform the operational check.
31. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Replace universal joints.

Performance Objectives:

Given a vehicle with malfunctioning universal joints, necessary tools and equipment, and service manual, the student will replace the universal joints, following the manufacturer's specifications.

Evaluation Criterion:

The student will replace the universal joints to the satisfaction of the instructor.

Upon the completion of the work, the drive shaft will function without excessive noise or vibration, and the U-joints will not leak.

Performance Guide:

1. Raise the vehicle on the hoist.
2. Remove the drive shaft, according to the manufacturer's instructions.
3. Disassemble the U-joints by pressing them out in a press, according to the manufacturer's instructions.
4. Install the drive shaft.
5. Road-test the vehicle for drive shaft vibration.
6. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Replace front drive axle assemblies.

Performance Objectives:

Given a vehicle with a malfunctioning front drive axle assembly, the necessary tools, equipment and service manual, the student will replace and adjust the front drive axle assembly, according to the manufacturer's specifications.

Evaluation Criterion:

The student will remove the malfunctioning front drive axle assembly and replace it with a new one to the satisfaction of the instructor.

Performance Guide:

1. Lift the vehicle and place stands under the frame.
2. Drain the differential.
3. Remove the front tires and wheels.
4. Remove the drive shaft with joint from the differential.
5. Remove the lower ends of the front shocks.
6. Disconnect the front brake line at the flex line.
7. Remove the front spring with bolts.
8. Lift the axle assembly up, and remove from either side.
9. To reinstall the new axle assembly, reverse the steps 3 to 8.
10. Fill the brake master cylinder and bleed the front brakes.
11. Refill the master cylinder.
12. Fill the differential with proper lubrication.
13. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Repair and adjust front drive axle assemblies.

Performance Objectives:

Given a vehicle with repairable defect in the front drive axle assembly, necessary tools, equipment and service manual, the student will repair and adjust the axle assembly, following the manufacturer's specifications.

Evaluation Criterion:

The student will locate the malfunction in the front drive axle assembly, and repair and adjust the axle assembly to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle and place on the jack stands.
2. Remove the rear drive shaft.
3. Place the transfer case gear in four-wheel drive.
4. Remove the locking hubs one at a time, and check the axle movement by turning the front drive shaft by hand to see if both axles turn.
5. Disassemble the lock hubs, and check for broken parts, following the manufacturer's recommended procedures for disassembly and reassembly.
6. Install the locking hubs and recheck with both drive shafts installed: Check for any abnormal noises, bearing whine or too much backlash.
7. Disassemble the drive assembly, following the manufacturer's recommended procedures.
8. Inspect all gears and bearings visually, and clean them thoroughly before reassembly.
9. Locate worn or broken parts, and replace with new parts if necessary.
10. Reassemble, and perform the operational road check for proper functioning.
11. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Replace mechanical-type clutch.

Performance Objectives:

Given a vehicle with a mechanical-type clutch, the necessary tools and service manual, the student will replace the clutch, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace and adjust the mechanical-type clutch to the satisfaction of the instructor.

After adjustment, the clutch mechanism will not have excessive noise, and the shift lever will operate without slippage or excessive pressure on the pedal.

Performance Guide:

1. Raise the vehicle to obtain access to the drive line and transcription.
2. Remove the drive shaft.
3. Remove the transmission, according to the manufacturer's instructions.
    a. Remove the clutch assembly.
    b. Check the clutch disc, pressure plate, flywheel and throw-out bearing.
    c. If any of them is bad, replace the entire clutch assembly, according to the manufacturer's specifications.
5. Following the specifications, reinstall the transmission.
6. Check the transmission fluid level and refill if necessary.
7. Road-test the vehicle for correct operation of the clutch and gear shifting of the transmission.
8. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Replace pinion seal.

Performance Objectives:

Given a vehicle with a leaky pinion seal, the necessary tools, equipment and service manual, the student will replace the pinion seal, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the pinion seal to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor.
2. Remove the rear drive shaft with joint at the differential.
3. Place the drain pan under the front of differential.
4. Remove the pinion nut.
5. Remove the yoke from the pinion shaft.
6. Remove the pinion seal using a seal puller.
7. Clean the housing and yoke.
8. Install the pinion seal using a seal driver.
9. Inspect the yoke for damage or wear.
10. Replace the yoke, if necessary.
11. Tighten to the manufacturer's specification.
12. Install the rear drive shaft with joint.
13. Check and fill the differential with the proper lubrication.
14. Check and clean the air vent.
15. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Replace pilot bearing.

Performance Objectives:

Given a vehicle with a faulty pilot bearing, the necessary tools, equipment and service manual, the student will replace the pilot bearing, following the manufacturer's specifications.

Evaluation Criterion:

The student will replace the pilot bearing to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle and place the safety stands under the frame.
2. Drain the transmission.
3. Remove the drive shaft.
4. Using the proper jack, remove the transmission.
5. Remove the clutch bearing, pressure plate and disc.
6. Remove the pilot bearing from the flywheel using a correct puller.
7. Install a new pilot bearing.
8. Install the clutch using aligning tools.
9. Install the transmission.
10. Install the drive shaft.
11. Refill the transmission with the specified lubricant.
12. Test for operation.
13. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Replace rear axle shaft, bearing and seal.

Performance Objectives:

Given a vehicle, tools, equipment and service manual, the student will replace the rear axle shaft, bearing and seal, following the manufacturer's recommendations.

Evaluation Criterion:

The student will replace the rear axle shaft, bearing and seal to the satisfaction of the instructor.

Performance Guide:

1. Lift the vehicle.
2. Remove the rear wheels.
3. Remove the rear brake drums.
4. Remove the axle bearing retainer bolts.
5. Remove the axle shaft.
6. Remove the bearing from the shaft: On most models bearings must be pressed off with an arbor press.
7. Clean the axle shaft.
8. Dress new bearing on the shaft.
9. Reverse steps 2 through 5 to reassemble the components.
10. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Replace speedometer drive gear.

Performance Objectives:

Given a vehicle with a malfunctioning speedometer drive gear, the necessary tools, equipment and service manual, the student will replace the speedometer drive gear, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the speedometer to the satisfaction of the instructor.

Performance Guide:

1. Remove the speedometer drive gear, according to the manufacturer's instructions.
2. Count the number of teeth on the gear, and check for the manufacturer's part number.
3. Determine what caused the drive gear to break, and correct the cause.
4. Install the speedometer drive gear.
5. Road-test the vehicle.
6. Have the instructor check your work.

DUTY: DRIVE TRAINS

TASK: Test manual transmission operation.

Performance Objectives:

Given a vehicle with a malfunction in the manual transmission, the necessary tools, equipment and service manual, the student will check the transmission in all speeds and identify the problems.

Evaluation Criterion:

The student will test the transmission and identify all the problems to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle, and place the safety stands under the frame.
2. Perform a visual inspection of the transmission for damages or leaks.
3. Start the engine and test the gears for where the malfunction occurs.
4. Determine what the malfunction is: clanging noise, whining noise, etc.
5. If no malfunction, lower the car and road-test for smooth operation.
6. Dynamometer-test for jumping out of gear.
7. Have the instructor check on your diagnosis.

DUTY: DRIVE TRAINS

TASK: Replace clutch release bearings (throw-out bearings).

Performance Objectives:

Given a vehicle, tools, equipment and service manual, the student will replace the clutch release bearing (throw-out bearing), following the manufacturer's recommendations.

Evaluation Criterion:

The student will replace the clutch release bearings to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle to obtain access to the drive line and transmission.
2. Remove the drive shaft.
3. Remove the transmission, according to the manufacturer's instructions.
4. Remove and replace the clutch release bearings: Make sure the clutch release bearings are packed with grease.
5. Following the specifications, install the transmission. Correct and adjust the linkage.
6. Check the transmission fluid level and refill if needed.
7. Road-test the vehicle for the correct operation of the clutch and gear shifting of the transmission.
8. Have the instructor check your work.

AUTOMOTIVE MECHANICS

III. AUTOMATIC TRANSMISSION (Service Mechanic)

Tasks covered in addition to those listed for mechanics helpers.

1. Adjust floor linkage.
2. Adjust column-type linkage.
3. Adjust linkage from engine to automatic transmission.
4. Diagnose and adjust modulators.
5. Replace and adjust modulators.
6. Inspect and repair transmission cooling systems.
7. Inspect, remove and replace convertor.
8. Inspect and replace front pump, seal, and bushings.
9. Install automatic transmission cooler (external type).
10. Make band adjustments (internal or external).
11. Overhaul automatic transmission.
12. Perform operational tests on automatic transmission.
13. Remove and install automatic transmissions.
14. Adjust neutral safety switch.
15. Replace and adjust neutral safety switch.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Adjust floor linkage.

Performance Objectives:

Given a vehicle with floor-mounted transmission linkage, the necessary tools, equipment and service manual, the student will adjust the transmission linkage, according to the manufacturer's recommendations.

Evaluation Criterion:

The student will adjust the transmission linkage to the satisfaction of the instructor.

Performance Guide:

1. Place the selector lever in D (drive) and raise the vehicle on a hoist.
2. Disconnect the cable from the transmission lever.
3. Move the lever to drive by rotating it counterclockwise to L (low) and then back on detent.
4. Measure the distance from the backside face of the attachment bracket to the center of the cable attachment pin.
5. Adjust the pin if necessary.
6. Install the cable to the transmission lever; lower the car; check the adjustment.
7. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Adjust column-type linkage.

Performance Objectives:

Given the necessary tools, equipment and service manual, the student will adjust the column-type transmission linkage, according to the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the column-type transmission linkage to the satisfaction of the instructor.

Performance Guide:

1. Loosen the adjustment clamp at the cross shaft.
2. Rotate the transmission lever to D (drive) position.
3. Set the selector lever to D (drive), and remove any free play by rotating and holding the cross shaft upward and pulling the shift rod down.
4. Tighten the clamp and recheck the adjustment.
5. Readjust the indicator needle, if necessary, to agree with the transmission detent position.
6. Readjust the neutral safety switch if necessary.
7. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Adjust linkage from engine to automatic transmission.

Performance Objectives:

Given a vehicle with an automatic transmission, the necessary tools, equipment and service manual, the student will adjust the engine-to-transmission linkage, according to the manufacturer's recommendations.

Evaluation Criterion:

The student will adjust the engine-to-transmission linkage to the satisfaction of the instructor.

Performance Guide:

1. Raise the hood of car; remove air cleaner and disconnect the accelerator linkage at the carburetor.
2. Disconnect the accelerator-return and TV-rod springs.
3. With the right hand, pull the TV upper rod forward until the transmission is through the detent.
4. With the left hand, open the carburetor to wide-open-throttle position.
5. Adjust the swivel on the upper TV rod as necessary.
6. Connect and adjust the accelerator linkage as necessary, and check for freedom of movement in linkage.
7. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Diagnose and adjust modulators.

Performance Objectives:

Given a vehicle with the modulator valve in the transmission out of adjustment, the necessary tools, equipment, and service manual, the student will adjust the modulator valve to meet the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the modulator valve to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle and support it on the stands.
2. Place a drain pan under the car to catch oil.
3. Disconnect the vacuum line.
4. If the modulator is an adjustable type, count the number of turns to remove the modulator.
5. Install a new modulator the same number of turns.
6. Reconnect the vacuum line and road-test the vehicle for shift pattern.
7. Readjust if necessary.
   If it needs readjustment, check the service manual for the direction of turns to fix the problem.
8. Have the instructor check your adjustments.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Replace and adjust modulators.

Performance Objectives:

Given a vehicle with a transmission modulator defect, the necessary tools, equipment and service manual, the student will replace the modulator valve, following the manufacturer's recommendations.

Evaluation Criterion:

The student will replace the modulator valve on the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Follow the manufacturer's recommended procedures.
2. Remove and performance-test the vacuum modulator.
3. Adjust or repair the vacuum modulator, as required.
4. Mount the vacuum in the transmission.
5. Perform the operational test of the transmission.
6. Have the instructor check your work.

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DUTY: AUTOMATIC TRANSMISSIONS

TASK: Inspect and repair transmission cooling systems.

Performance Objectives:

Given an automobile with leaks in the transmission cooling system, the necessary tools, equipment and service manual, the student will locate the leaks and repair or replace the defective parts, according to the manufacturer's specifications.

Evaluation Criterion:

The student will locate the leaks and make the necessary repair or replacements to stop the leak in the transmission cooling system, to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle to obtain access to the transmission and oil cooling lines.
2. Locate the leaks and make appropriate repairs.
3. Check all the cooling lines and fittings.
4. Adjust the transmission fluid level if necessary.
5. Recheck the complete cooling system for proper fittings and new leaks.
6. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Inspect, remove and replace convertor.

Performance Objectives:

Given a vehicle with a defective convertor, the necessary tools, equipment and service manual, the student will replace the torque convertor, following the manufacturer's recommendations.

Evaluation Criterion:

The student will remove and replace the defective convertor to the satisfaction of the instructor.

Performance Guide:

1. Place the vehicle on a lift.
2. Disconnect the battery.
3. Drain oil from the transmission.
4. Disconnect all the component parts.
5. Remove the propeller shaft.
6. Place a transmission jack under the transmission.
7. Remove mounting bolts, and raise the transmission slightly.
8. Remove the cross member.
9. Lower the transmission slightly.
10. Remove the torque convertor to flex plate bolts.
11. Remove the lull housing bolts.
12. Move the transmission slightly to the rear and lower.
13. Remove the transmission jack.
14. Remove the torque convertor if bad.
15. Replace with a new torque convertor, making sure it goes all the way in.
16. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Inspect and replace front pump, seal, and bushings.

Performance Objectives:

Given a vehicle with a faulty transmission front pump, the necessary tools, equipment and service manual, the student will remove and replace the front pump, seals and front pump bushings, according to the manufacturer's specifications.

Evaluation Criterion:

The student will remove and replace the front pump, seals and bushings to correct the problem.

Performance Guide:

1. Follow the manufacturer's recommendations for proper transmission overhaul procedures.
2. Determine the reason for the leakage in the front pump:
   a. defective or worn seal.
   b. convertor seal surface scored.
   c. worn bushing or damaged O-ring.
3. Remove the front pump assembly from the transmission case, following the proper procedures in the manual.
4. Check the pump rotors and housing for excessive wear:
   If over the allowed clearance, recommend a replacement pump.
5. Replace the front pump bushing, following the prescribed procedures.
6. Replace the front pump oil seal, following the prescribed procedures.
7. Install a new O-ring seal or gasket on the pump housing.
8. Install the pump assembly case, following the prescribed procedures.
9. Performance-test the transmission.
10. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Install automatic transmission cooler (external type).

Performance Objectives:

Given a vehicle with a defective automatic transmission cooler, the necessary tools, equipment and service manual, the student will remove and replace the automatic transmission cooler, following the manufacturer's recommendations.

Evaluation Criterion:

The student will remove the old transmission cooler and replace it with a new one, to the satisfaction of the instructor.

Performance Guide:

1. Raise the hood. Disconnect the cooler lines from the internal cooler on the radiator.
2. Find a logical place to mount a new external cooler.
3. Use the counting template supplied with the cooler to drill holes to mount the cooler.
4. Mount the cooler, and connect the existing cooler lines to the new cooler.
5. Crank the engine, and check for leaks.
6. Adjust the fluid level if needed.
7. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Make band adjustments (internal or external).

Performance Objectives:

Given a vehicle, the necessary tools, equipment and service manual, the student will make adjustments to the automatic transmission bands, following the manufacturer's recommendations.

Evaluation Criterion:

The student will adjust the bands on the automatic transmission to the satisfaction of the instructor.

Upon completion, the clutch will engage fully and not slip.

Performance Guide:

1. Determine whether an adjustment is to be made on the exterior or interior band adjustors.
2. If interior, remove the transmission oil pan, and drain oil.
   Loosen the lock nut and turn the adjustor the correct number of turns, according to the manufacturer's specifications.
3. If external, locate the adjusting screw.
   a. Remove the protective cap.
   b. Loosen the lock nut.
   c. Adjust to the manufacturer's specifications.
4. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Overhaul automatic transmission.

Performance Objectives:

Given an automatic transmission needing overhaul, the necessary tools, equipment and service manual, the student will overhaul the transmission, according to the manufacturer's specifications.

Evaluation Criterion:

The student will overhaul an automatic transmission, and repair or replace all defective parts.

Performance Guide:

1. Clean the outside of the transmission.
2. Prepare for disassembly.
3. Remove the convertor.
4. Remove the oil pan and valve body.
5. Install a dial indicator, and check the end play.
6. Check the service manual for the type of transmission assigned. Parts to be removed vary from transmission to transmission.
7. Remove the front oil pump, front band and front clutch assembly.
8. Remove the extension housing, governor and rear pump if equipped.
9. Remove the overrunning clutch and rear band assembly.
10. Remove the servo retainers and servo pistons.
11. Clean all transmission parts and replace defective components where necessary.
12. Reassemble the transmission by reversing steps 3 through 10.
13. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Perform operational tests on automatic transmission.

Performance Objectives:

Given a vehicle and service manual, the student will perform an operational test of an automatic transmission at all selector speeds and identify any existing problems.

Evaluation Criterion:

The student will perform operational tests on the automatic transmission and identify the existing problems.

Performance Guide:

1. Check the transmission fluid.
2. Check the operation at varying speeds.
3. Check the transmission under various operational conditions.
4. Check for leaks.
5. Have the instructor check your operational test results.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Remove and install automatic transmissions.

Performance Objectives:

Given a vehicle with a transmission faulty beyond repair, the necessary tools, equipment and service manual, the student will remove and replace the transmission to the manufacturer's specifications.

Evaluation Criterion:

The student will remove the old transmission and replace it with a new one to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle to obtain the access to the transmission.
2. Locate in the service manual information on the proper procedures for removal and replacement of the transmission and the convertor assembly.
3. Drain the transmission fluid.
4. Support the engine with a jack.
5. Remove the drive shaft.
6. Remove the transmission mount and the frame cross member.
7. Disconnect the shift linkage, speedometer cable, filler tube, oil cooler lines and modular tubes and/or wires.
8. Remove the convertor to flywheel bolts.
9. Disconnect the battery ground cable from the battery.
10. Remove the starter motor.
11. Remove the transmission engine bolts, and remove transmission and convertor assembly with the use of a transmission jack.
12. Reverse steps 3 through 11 for installation of a new transmission.
13. Road-test the vehicle for proper transmission performance.
14. Have the instructor check your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Adjust a neutral safety switch.

Performance Objectives:

Given a vehicle with a neutral safety switch needing adjustments, the necessary tools, equipment, and service manual, the student will adjust the neutral switch to meet the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the neutral safety switch to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle on jack stands.
2. Locate the switch on the steering column.
3. Loosen the two attaching screws for the switch.
4. Place the lever in park (P) or neutral (N), and readjust the switch until the car starts easily.
5. Tighten up the screws and lower the car.
6. Have the instructor check on your work.

DUTY: AUTOMATIC TRANSMISSIONS

TASK: Replace and adjust a neutral safety switch.

Performance Objectives:

Given a vehicle, the necessary tools, replacement parts and service manual, the student will replace the neutral switch on the automatic transmission, following the manufacturer's procedures.

Evaluation Criterion:

The student will replace the neutral safety switch to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle on jack stands, and place oil pan under the transmission.
2. Disconnect the wire from the neutral switch, and remove the switch from the transmission case.
3. Install a new switch using the new O-ring.
4. Reconnect the wire to the neutral switch.
5. Check whether the car starts in park or neutral: If not, adjust the manual linkage.

If the switch is on the steering column, do the following:

1. Locate the switch on the steering column.
2. Disconnect the multi-prong wire connector.
3. Loosen the two attaching screws for the switch.
4. Place the switch in position; tighten screws and connect wires.
5. Adjust the switch until the car starts in park or neutral.

IV. ELECTRICAL SYSTEMS (Service Mechanic)

Tasks Covered in addition to those listed for mechanics helpers.

1. Analyze or adjust engine performance using engine analyzer.
2. Analyze cause of electrical fires.
3. Analyze malfunctions in the cranking system.
4. Inspect secondary circuit lead wires, distributor cap, and rotor. Measure resistance in secondary wires.
5. Inspect ignition switch, resistor, wiring, and coil of the primary circuit.
6. Replace coil of the primary circuit.
7. Repair or replace switches.
8. Replace ignition switch and resistor.
9. Set ignition timing.
10. Inspect points and condenser of the primary circuit.
11. Replace points and condenser.
12. Evaluate alternator/generator output.
13. Repair or replace charging system regulators.
14. Repair generators or alternators.
15. Replace generators and alternators.
16. Replace and adjust distributors.
17. Strobe distributor, and modify or correct advance curves.
18. Replace chassis and underhood wiring.
19. Replace solenoids.
20. Repair starters.
21. Replace starters.
22. Repair or replace fuse box assembly.
23. Repair or replace lighting system components.
24. Replace flasher units.
25. Test and repair cruise control units.
26. Test and rewire dash units.
27. Inspect and test windshield wiper motors, blades, and arms.
28. Repair windshield wiper mechanisms and controls.
29. Test and repair transistor ignition systems.

DUTY: ELECTRICAL SYSTEMS

TASK: Analyze or adjust engine performance using engine analyzer.

Performance Objectives:

Given an engine analyzer, service manual and the necessary tools, the student will test and perform minor adjustments as necessary on a given vehicle.

Evaluation Criterion:

The student will test and perform minor adjustments on the given engine using the engine analyzer to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for the following specifications:
    a. curb idle adjustment: ± 50 r.p.m.
    b. air-fuel mixture adjustment:
    c. dwell adjustment: ± 2°.
    d. ignition timing adjustment: ± 1°.
2. Refer to the engine analyzer manufacturer's operating instructions to determine the analyzer testing procedures.
3. Perform the testing to determine the required adjustments.
4. Perform all required minor adjustments, according to the manufacturer's specifications.
5. Have the instructor check your adjustments.

DUTY: ELECTRICAL SYSTEMS

TASK: Analyze cause of electrical fires.

Performance Objectives:

Given a vehicle with shorted, burned electrical wiring and a service manual, the student will determine the cause of the fire and estimate the required repairs, according to the manufacturer's specifications.

Evaluation Criterion:

The student will determine the cause of the fire and identify all necessary repairs to the satisfaction of the instructor.

Performance Guide:

1. Determine the circuit or circuits involved.
2. Check all fuses in fuse block.
3. Refer to the overhaul manual on the prescribed vehicle wiring-schematic.
4. Consult the flat rate manual on the electrical circuit as to the alloted time.
5. Determine the components and wiring which are damaged.
6. Have the instructor check your findings.

DUTY: ELECTRICAL SYSTEMS

TASK: Analyze malfunctions in the cranking system.

Performance Objectives:

Given a vehicle with a malfunction in the cranking circuit, the necessary tools, equipment and service manual, the student will identify the malfunction and estimate the required repair needed to meet the manufacturer's specifications.

Evaluation Criterion:

The student will identify the problem and the necessary repairs to correct it, to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual to determine the specification.
2. Check the testing equipment operating instructions to determine the testing procedures.
3. Perform the following tests:
   a. Battery capacity test.
   b. Starter draw test.
   c. Voltage drop test (Starter cables).
   d. Starter control circuits test.
4. List the components and/or service required to repair the vehicle, according to the manufacturer's specifications.
5. Have the instructor check your findings.

DUTY: ELECTRICAL SYSTEMS

TASK: Inspect secondary circuit lead wires, distributor cap, and rotor. Measure resistance in secondary wires.

Performance Objectives:

Given a vehicle, the student will visually inspect the secondary wires, distributor cap and rotor; the student will make ohmmeter checks to determine if replacement is necessary to meet the manufacturer's specifications.

Evaluation Criterion:

The student will make ohmmeter check and visual inspections of the circuit and identify the malfunctions to the satisfaction of the instructor.

Performance Guide:

1. Refer to the service manual to determine the specifications.
2. Perform a visual check on the condition of the distributor cap and rotor.
   a. Look for cracks in both components.
   b. Look for corrosion on the cap towers.
3. Test the secondary wires for resistance.
4. List those components needing replacements.
5. Have the instructor check your findings.

DUTY: ELECTRICAL SYSTEMS

TASK: Inspect ignition switch, resistor, wiring, and coil of the primary circuit.

Performance Objectives:

Given the necessary testing equipment and the components of a primary circuit (ignition switch, resistor, wiring and coil), the student will perform a visual inspection and tests to determine whether each unit meets the manufacturer's specifications.

Evaluation Criterion:

The student will inspect and test the ignition switch, resistor, wiring and coil of a given primary circuit and identify any existing problems to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual to determine the specifications for the primary ignition circuit components.
2. Test the following components:
    - a. ignition switch.
    - b. ignition resistor.
    - c. ignition primary circuit wiring.
    - d. ignition coil.
    - e. ignition bypass circuit.
3. List any defective components.
4. Have the instructor check your findings.

DUTY: ELECTRICAL SYSTEMS

TASK: Replace the coil of the primary circuit.

Performance Objectives:

Given an engine, the necessary tools and a new ignition coil, the student will replace the ignition coil, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the coil and test the engine for proper functioning, to the satisfaction of the instructor.

Performance Guide:

1. Remove any parts necessary to obtain access to the coil.
2. Remove the primary and secondary wires from the coil.
3. Remove the securing bolts and coil.
4. Reinstall the replacements reversing steps 1-3.
5. Test the ignition system.
6. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Repair or replace switches.

Performance Objectives:

Given a vehicle with various types of switches, the necessary tools, equipment and a service manual, the student will identify the defective switches and repair or replace them as necessary.

Evaluation Criterion:

The student will identify the defective switches on the given vehicle and repair or replace them for proper working order, within a time considered reasonable by the instructor.

Performance Guide:

1. Using an ohmmeter, check for continuity across the terminals with the switch in each position.
2. Identify the defective switches.
3. Make the appropriate repairs and replacements according to the service manual.
4. Test the switches for proper functioning after the repairs or replacements have been made.
5. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Replace ignition switch and resistor.

Performance Objectives:

Given a vehicle, the necessary tools, and new parts, the student will replace the ignition switch and resistor, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the ignition switch and resistor in the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Locate the ignition switch.
2. Check the service manual for the proper procedure for the removal and installation of the ignition switch.
3. Remove the ignition switch.
4. Install the new ignition switch.
5. Check for proper operation.
6. Locate the ignition resistor.
7. Check the manual on the proper procedures for the removal and installation of the ignition resistor.
8. Remove the ignition resistor (wire on ballast).
9. Install the new ignition resistor.
10. Check for proper operation.
11. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Set ignition timing.

Performance Objectives:

Given an engine, the necessary tools, equipment and service manual, the student will set the ignition timing to meet the manufacturer's specifications.

Evaluation Criterion:

The student will set the ignition timing within ± 1° of the manufacturer's specifications.

Performance Guide:

1. Check the manual for the proper procedures and specifications.
2. Connect the timing light in the circuit.
3. Loosen the distributor mounting bolts.
4. Start the engine and operate at the specified idle.
5. Turn the distributor to get a desired timing setting.
6. Reset the idling to the proper specification.
7. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Inspect points and condenser of the primary circuit.

Performance Objectives:

Given a distributor, the student will inspect the contact points and the condenser using an ohmmeter to determine the necessary replacement, according to the specifications.

Evaluation Criterion:

The student will inspect the contact points and condenser and determine any necessary replacements to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual to find the specification.
2. Perform the visual inspection of the ignition points for:
   a. condition of the contact points surface.
   b. alignment of the contact points.
   c. spring tension.
3. Do a condenser leakage test.
4. Perform any additional checking recommended by the manufacturer.
5. List any defects.
6. Have the instructor check your findings.

DUTY: ELECTRICAL SYSTEMS

TASK: Replace points and condenser.

Performance Objectives:

Given a vehicle, the necessary tools, equipment, ignition points and condenser, the student will replace the ignition points and condenser, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the ignition points and condenser on the vehicle, to the satisfaction of the instructor.

The degree of the dwell must be within ± 2° of the manufacturer's specifications.

Performance Guide:

1. Raise the hood of the vehicle and remove the distributor cap.
2. Loosen the lead screw and detach the leads.
3. Loosen the two screws holding the contact set to the breaker plate.
4. Slip the contact set out from under the screws.
5. Wipe the breaker plate clean and oil the lever post.
6. Install the new contacts; attach leads; and adjust the point opening. Make sure the contacts are properly aligned.
7. Tighten all the screws, and check the point opening again.
8. Lubricate the distributor as specified, and reassemble the distrubutor cap to its base.
9. Turn the engine on, and test the points and condenser.
10. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Evaluate the alternator/generator and regulator output.

Performance Objectives:

Given the necessary testing equipment and the specification manual, the student will test the charging circuit on a given automobile to determine if its performance meets the manufacturer's specifications.

Evaluation Criterion:

The student will test the charging circuit in the vehicle and evaluate the alternator/generator and regulator output.

Performance Guide:

1. Refer to the service manual to determine the specifications for the charging circuit.
2. Refer to the test equipment operating instructions to determine the testing procedures.
3. Perform the following tests:
   a. Output test.
   b. Voltage regulator test.
   c. Current regulator test, if so equipped.
   d. Charging circuit voltage drop test.
4. Record the test results and compare with the manufacturer's specifications.
5. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Repair or replace charging system regulators.

Performance Objectives:

Given a vehicle with trouble in the voltage regulator, the necessary test equipment, tools, and service manual, the student will locate the problem and repair or replace the component as necessary, according to the manufacturer's specifications.

Evaluation Criterion:

The student will locate the problem in the voltage regulator and make the appropriate repairs and/or replacement, to the satisfaction of the instructor.

Performance Guide:

1. Disconnect the ground cable at the battery.
2. Disconnect the wiring harness from the regulator.
3. Remove the mounting screws and remove the regulator.
4. Check the regulator and make necessary adjustments if possible; if not, replace with a new regulator.
5. Make sure that the regulator base gasket is in place before installation.
6. Make sure the mounting screws are not over-tightened to eliminate damages to the bushing on the base of the mounting screws.
7. To replace the regulator, reverse the disassembly procedures.
8. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Repair generators or alternators.

Performance Objectives:

Given a generator or alternator with a malfunction, the necessary tools, equipment and service manual, the student will complete the necessary repairs on the alternator/generator, according to the manufacturer's specifications.

Evaluation Criterion:

The student will identify the problem generator/alternator, to the satisfaction of the instructor, and make the necessary repairs to meet the manufacturer's specifications.

Performance Guide:

Generator Repairs:

1. Remove the generator adjustment brace, belt, and mounting bolts.
2. Remove the battery cable and wires from the generator field, armature and ground.
3. Remove two bolts from the brush hold or end plate.
4. Check the end plate bushing, drive, bushing or bearings, and brushes: Replace if necessary.
5. Check the armature and fields for ground, open or shorted circuits.
6. Check the commutator end of armature condition: Turn and undercut commutator if necessary.
7. Replace all parts necessary to make the generator operate to the manufacturer's specifications.

Alternator Repairs:

1. Remove the four case frame bolts.
2. Separate the drive end frame and rotor from stator assembly by prying with screwdriver lightly: Make alignment marks on both ends.
3. Separation is between the stator frame and the drive end frame.
4. Place a tape over slip ring or brush end frame bearing to seal it from dirt.

DUTY: ELECTRICAL SYSTEMS

TASK: Repair generators or alternators.

Performance Guide: (cont.)

5. Lightly clamp the rotor in vise to remove the shaft nut, making sure not to overtighten vise and damage the rotor.
6. Remove the nut from the rotor shaft; take off the washer, pulley, fan and collar or spacer.
7. Separate the drive end frame from the rotor shaft.
8. Remove three stator lead attaching nuts and separate stator from the end frame.
9. Remove the screws, brushes and holder assembly.
10. Remove the battery, ground, and the attaching screw terminal; then remove the heat sink.
11. All diodes are marked with either "+" or "-" on the head, or are marked with red paint for "+" diode, and black paint for "-" diodes to identify the polarity of the case.
12. In negative ground systems, the negative diodes are mounted into the slip ring end frame; the positive diodes are mounted into the insulated heat sink.
13. Test the diodes and replace if necessary.
14. Test the rotor for the grounded, open or shorted field coils.
15. Check the stator for the grounded, open or shorted windings.
16. Check the slip rings if they are rough or out of round. Replace if necessary.
17. Check the brushes and replace if necessary.
18. To reassemble the alternator, reverse the above procedures.
19. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Replace generators and alternators.

Performance Objectives:

Given a vehicle, the necessary equipment, tools and service manual, the student will install a new generator/alternator into a vehicle, according to the manufacturer's specifications.

Evaluation Criterion:

The student will remove the old alternator/generator and replace it with a new one to the satisfaction of the instructor.

Performance Guide:

1. Check the engine performance before removing the alternator or generator.
2. Disconnect the battery cables from the battery terminals.
3. Disconnect and mark the wire leads from the alternator.
4. Remove the alternator brace bolt; then remove the belt or belts.
5. Remove the alternator pivot attaching bolt, and remove the alternator from the vehicle.
6. Install the replacements reversing steps 2-5.
7. Adjust the belt tension.
8. Start the engine and check for proper performance.
9. Have the instructor check your performance.

DUTY: ELECTRICAL SYSTEMS

TASK: Replace and adjust distributors.

Performance Objectives:

Given an operational engine, the necessary tools, equipment and a new ignition distributor, the student will replace the distributor and make the necessary adjustments, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the distributor on the engine and set the timing within ± 1° of the manufacturer's specifications.

Performance Guide:

1. Check the manufacturer's service manual for proper procedures and specifications.
2. Remove the coil wire from the top of the distributor and the ground to the engine block.
3. Crank the engine until the number one cylinder is at the top-dead-center on the compression stroke.
4. Install the distributor with the rotor pointing towards number one cylinder on the distributor cap.
5. Replace the hold-down plate and screw.
6. Replace the rotor and distributor cap.
7. Place the wires in the distributor cap, according to the firing order of the manufacturer's specifications.
8. Start the engine.
9. Set the engine r.p.m. ignition timing, dwell degree angle; reset the r.p.m. and check the engine performance.
10. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Strobe distributor, and modify or correct advance curves.

Performance Objectives:

Given a distributor, the necessary tools, and testing equipment, the student will place the distributor in the machine; check the timing and dwell angle; then make the necessary adjustments.

Evaluation Criterion:

The student will place the distributor in the distributor machine, check the timing and dwell angle, and make the necessary adjustments to meet the manufacturer's specifications.

Performance Guide:

1. Place the distributor in the machine.
2. Check the advance spring tension.
3. Check the point spring for the correct tension.
4. Check the distributor shaft bushing for wear.
5. Set the dwell angle and points for the cam bounce.
6. If the distributor machine is not available, place the distributor in the live engine and check the advance and point spring tension; make the necessary adjustment.
7. Disconnect the distributor vacuum advance hose from the distributor and plug hose.
8. Locate the timing marks at the front of the engine on the engine harmonic balancer.
9. Put a small amount of white paint or chalk on the correct marks so they are more visible.
10. Connect the timing light to the number one cylinder.
11. Loosen the distributor hold-down screw.
12. Start the engine, and rotate the distributor until the correct marks line up.
13. Tighten the distributor hold-down screw, and check the timing again.
14. Reconnect the vacuum hose, and check the performance of the vehicle.
15. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Replace chassis and underhood wiring.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and service manual, the student will replace the chassis and underhood wiring, according to the manufacturer's procedures.

Evaluation Criterion:

The student will replace the chassis and underhood wiring in the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Follow the manufacturer's recommended procedures.
2. Remove the designated wiring harness.
3. Install a new wiring harness.
4. Test the replaced harness.
5. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Replace solenoids.

Performance Objectives:

Given a vehicle with a defective solenoid, the necessary tools, equipment and service manual, the student will replace the solenoid according to the manufacturer's specifications.

Evaluation Criterion:

The student will remove the defective solenoid and replace it with a new one to the satisfaction of the instructor.

Performance Guide:

1. Remove the positive (+) battery terminal from the battery post.
2. Remove the wires from the solenoid, and mark them for future hook-ups.
3. Check visually the terminal connections for breaks, corrosion, etc. which would keep solenoid from energizing.
4. Remove the starter solenoid, according to the manufacturer's specifications.
5. Install a new starter solenoid to the manufacturer's specifications.
6. Install the positive (+) battery terminal to the battery post.
7. Test check starter solenoid.
8. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Repair starters.

Performance Objectives:

Given a vehicle with a faulty starter, the necessary tools, equipment and service manual, the student will repair the starter to meet the manufacturer's specifications.

Evaluation Criterion:

The student will identify the problem in the starter and make the necessary repairs to the satisfaction of the instructor.

Performance Guide:

1. Remove the positive battery cable lead at the battery terminal.
2. Remove the starter wires.
3. Remove the starter from the vehicle.
4. Repair the starter to correct the problem.
5. Install the starter reversing steps 1 - 3.
6. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Replace starters.

Performance Objectives:

Given the necessary tools, equipment and service manual, the student will replace the starter on a vehicle, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the starter and test for proper performance to the satisfaction of the instructor.

Performance Guide:

1. Remove the positive (+) battery cable from the battery terminal.
2. Install a new starter to the starter mounting using the proper tools.
3. Check the service manual for the proper hook-up of the wiring.
4. Install the positive (+) battery cable on the battery terminal.
5. Perform the starter-draw test to meet the manufacturer's specifications.
6. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Repair or replace fuse box assembly.

Performance Objectives:

Given a vehicle with trouble in the fuse block, the necessary tools and equipment and service manual, the student will repair or replace the fuse block to meet the manufacturer's specifications.

Evaluation Criterion:

The student will repair or replace the fuse block to the satisfaction of the instructor.

Performance Guide:

1. Disconnect the battery cables from battery.
2. Disconnect the fuse block from the vehicle.
3. Disconnect wire leads from the fuse block.
4. Determine the cause of the problem in the fuse block.
5. Repair the fuse block, or replace it if necessary.
6. Reconnect the wire leads to the fuse block, and attach the block to the vehicle.
7. Reconnect the battery cables.
8. Test the fuse block for proper functioning.
9. Have the instructor check your repair.

DUTY: ELECTRICAL SYSTEMS

TASK: Repair or replace lighting system components.

Performance Objectives:

Given a vehicle with problems in the lighting system, the necessary equipment, tools, and service manual, the student will locate and repair or replace the defective components, according to the manufacturer's specifications.

Evaluation Criterion:

The student will repair or replace the malfunctioning components in the lighting system to the satisfaction of the instructor.

Performance Guide:

1. Determine which lights are not operating.
2. Find the fuse box and check for a blown fuse or fuse lead problem.
3. If no problems are found in the fuse box area, check the following:
   a. Check bulbs for continuity or burn-out.
   b. Check the current at the light socket using a test light.
   c. Trace the circuit, and check each of the connectors for shorts with a test light.
   d. Test each connector back to the switch.
   e. Check switches for shorts.
   f. When short is located, identify and repair or replace the appropriate components to correct the problems.
4. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Replace flasher units.

Performance Objectives:

Given a vehicle with a faulty flasher unit, the necessary tools, equipment, and service manual, the student will replace the flasher unit, according to the manufacturer's specifications.

Evaluation Criterion:

Replace the flasher unit to the satisfaction of the instructor.

Performance Guide:

1. Locate the flasher unit.
2. Remove the unit from the holder.
3. Install a new unit. Make sure it is properly inserted in the holder.
4. Check for proper operation.
5. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Test and repair cruise control units.

Performance Objectives:

Given a vehicle with a malfunctioning cruise control, the necessary tools, equipment and service manual, the student will perform the necessary tests to identify the problem and make the necessary repairs to meet the manufacturer's specifications.

Evaluation Criterion:

The student will determine the cause for the malfunctioning cruise control and make the necessary repairs to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle off the floor.
2. Start the engine.
3. Bring the speed up to the desired cruise speed.
4. Engage the cruise control.
5. Observe the operation to maintain the cruise speed.
6. Depress the brake pedal.
7. Observe the operation to disengage the cruise control.
8. If a dynamometer is available, adjust the rear wheel load to check or simulate road conditions.
9. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Test and rewire dash units.

Performance Objectives:

Given a vehicle with a problem in the dash unit, the necessary tools, equipment and service manual, the student will locate the malfunction and make the necessary repairs to meet the manufacturer's specifications.

Evaluation Criterion:

The student will locate the malfunction and make the necessary repairs to the satisfaction of the instructor.

Performance Guide:

1. Determine which dash unit is defective.
2. Check the manual on the replacement procedures of the defective unit.
3. Remove the defective unit.
4. Repair the unit if possible.
5. Install the repaired unit or replacement.
6. Check for proper performance.
7. Have the instructor check your work.

DUTY: ELECTRICAL SYSTEMS

TASK: Inspect and test windshield wiper motors, blades, and arms.

Performance Objectives:

Given an automobile, the necessary tools, and equipment, the student will inspect the windshield wiper motor, blades, and arms and determine the necessary repairs if any.

Evaluation Criterion:

The student will inspect the windshield wiper motor, blades and arms on the given vehicle, identify any defects and report to the instructor any repairs necessary.

Performance Guide:

1. Check the wiper blade for wear and tear: Test the blade by putting water on the windshield and turning the wiper on.
2. Check the wiper arms for signs of rust and/or corrosion requiring lubrication.
3. Check motor for exterior defects such as wear on the pivot assembly, unusual noises while in operation, or jerkiness of the blades.
4. Check the wiper arms for proper spring tension on the windshield.
5. Check to see if the wipers shut off at correct intervals.
6. Have the instructor check your findings.

DUTY: ELECTRICAL SYSTEMS

TASK: Repair windshield wiper mechanisms and controls.

Performance Objectives:

Given a vehicle with defective windshield wiper mechanisms and controls, the student will repair all malfunctions, according to the manufacturer's instructions.

Evaluation Criterion:

The student will make the necessary repairs to restore the wipers to proper working order.

Performance Guide:

1. Check the dash control lever or button for shorts or poor contact points.
2. Check the dash control to determine if lever is sticking or too loose.
3. Check the electric wiper motor for defects.
4. Check for problems in the linkage, drive crank, or pivot.
5. Check the reduction gears for wear.
6. Repair or replace the malfunctioning components.
7. Test the wipers and controls for proper functioning.
8. Have the instructor check your repairs.

DUTY: ELECTRICAL SYSTEMS

TASK: Test and repair transistor ignition systems.

Performance Objectives:

Given a vehicle with a problem in the transistor ignition, the necessary test equipment and tools, the student will identify the malfunction and repair or replace the components to meet the manufacturer's specifications.

Evaluation Criterion:

The student will identify the problem in the transistor ignition and repair or replace the parts to the satisfaction of the instructor.

Performance Guide:

1. Disconnect the distributor leads from the engine wiring harness.
2. Connect the two leads of an ohmmeter to the distributor leads at the connector.
3. Rotate the magnetic pickup assembly in the distributor through the full vacuum advance travel and read the ohmmeter.
   a. The reading should be within 500 to 700 ohms range.
   b. If not in the above range, replace the magnetic pickup assembly.
   c. If the reading is within 500 to 600 ohms range, disconnect one ohmmeter lead from the distributor connector and connect it to a good ground.
   d. If the ohmmeter needle moves to the end of the scale and there is no spark when the spark plug wire is disconnected from the plug, the amplifier is bad: Replace the amplifier.
4. Have the instructor check your work.

V. CARBURETOR AND EMISSION (Service Mechanic)

Tasks covered in addition to those listed for mechanics helpers.

1. Learn about pollution control. (Theory only)
2. Learn P.C.V. crankcase emission control systems. (Theory only)
3. Know the basic P.C.V. engine modification. (Theory only)
4. Identify exhaust emission control systems. (Theory only)
5. Identify evaporative emission control systems. (Theory only)
6. Adjust infra-red machine.
7. Test for hydrocarbon and carbon monoxide level.
8. Adjust carburetor.
9. Repair or service carburetors.
10. Analyze for moisture or foreign particle level in fuel system.
11. Adjust choke unit, (automatic and manual).
12. Inspect, clean and adjust choke unit (automatic and manual).
13. Replace gas tank sending unit.
14. Measure fuel flow and pressure.
15. Perform operational inspections of exhaust emission control system.
16. Perform operational inspections of evaporative emission control system.
17. Service or repair manifold heat controls.
18. Remove and replace fuel pump.
19. Repair or replace fuel lines and hoses.

DUTY: CARBURETOR AND EMISSION

TASK: Learn about pollution control. (Theory only)

Performance Objectives:

The student will obtain a basic understanding of pollution ecology.

Evaluation Criterion:

The student will show his understanding and knowledge of the Federal Emission Control Laws and Standards by explaining them in his own words, to the satisfaction of the instructor.

Performance Guide:

1. View the materials on the emission control in the slide/study series.
2. Give a verbal report to the instructor showing your understanding of the topic.

DUTY: CARBURETOR AND EMISSION

TASK: Learn P.C.V. crankcase emission control systems. (Theory only)

Performance Objectives:

The student will demonstrate his understanding of the P.C.V. crankcase emission control systems.

Evaluation Criterion:

The student will test and identify both good and bad PCV valves to the satisfaction of the instructor.

Performance Guide:

1. View the slide/study series on the PCV crankcase emission control.
2. Identify the bad draft tube and PCV valve.
3. Test the PCV.
4. Have the instructor check your test.

DUTY: CARBURETOR AND EMISSION

TASK: Know the basic P.C.V. engine modification. (Theory only)

Performance Objectives:

The student will demonstrate a basic understanding of PCV engine modification.

Evaluation Criterion:

The student will identify the various engine modifications and the function of each modification to the satisfaction of the instructor.

Performance Guide:

1. View the slide/study series on engine modifications.
2. Identify various engine modifications.
3. Identify the function of each engine modification.

DUTY: CARBURETOR AND EMISSION

TASK: Identify exhaust emission control systems. (Theory only)

Performance Objectives:

The student will identify various exhaust emission control systems.

Evaluation Criterion:

The student will demonstrate his understanding and knowledge by identifying the various Chrysler, American Motors, and Ford exhaust emission control systems and their functions, to the satisfaction of the instructor.

Performance Guide:

1. View the slide/study series on exhaust emission control systems.
2. Identify the various exhaust emission control systems.
3. Identify the function of each system.

DUTY: CARBURETOR AND EMISSION

TASK: Identify evaporative emission control systems. (Theory only)

Performance Objectives:

The student will identify the various evaporative emission control systems of all automobile manufacturers.

Evaluation Criterion:

The student will demonstrate his basic understanding of the systems by identifying the function of each system to the satisfaction of the instructor.

Performance Guide:

1. View the slide/study series on evaporative emission control systems.
2. Identify each system and its function.

DUTY: CARBURETOR AND EMISSION

TASK: Adjust infra-red machine.

Performance Objectives:

The student will adjust the infra-red machine.

Evaluation Criterion:

The student will adjust the infra-red machine to the satisfaction of the instructor.

All the meters must be in proper calibration.

Performance Guide:

1. Plug the machine into 110 AC outlet.
2. Turn the master switch on.
3. Calibrate the span jet.
4. Calibrate the set line.
5. Allow a one-hour warm-up.
6. Turn the selector knob to test the position.
7. Have the instructor check your adjustment.

DUTY: CARBURETOR AND EMISSION

TASK: Test for hydrocarbon and carbon monoxide level.

Performance Objectives:

The student will test for hydrocarbon and carbon monoxide level.

Evaluation Criterion:

The student will run the test for the hydrocarbon and carbon monoxide level to the satisfaction of the instructor.

All the readings must be recorded accurately.

Performance Guide:

1. Install a pick up in the tailpipe.
2. Read the meters.
3. Record the readings.
4. Make the necessary corrections and adjustment with combustion analyzer to meet the manufacturer's specifications.

DUTY: CARBURETOR AND EMISSION

TASK: Adjust carburetor.

Performance Objectives:

Given a vehicle and the necessary tools and equipment, the student will adjust the carburetor to the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the carburetor to within ± 50 RPMs of the manufacturer's specifications.

Performance Guide:

1. Connect the tachometer to the vehicle.
2. Adjust the idle mixture screws according to the manufacturer's specifications.
3. Adjust the curb idle adjustment screw according to the specifications.
4. Remove the tachometer.
5. Test-drive the vehicle.
6. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Repair or service carburetors.

Performance Objectives:

Given a vehicle with a malfunctioning carburetor, the necessary tools, equipment and a service manual, the student will diagnose the problem and service or repair the malfunction to the manufacturer's specifications.

Evaluation Criterion:

The student will locate the problem and repair the carburetor to the satisfaction of the instructor.

Performance Guide:

1. Road-test or start the vehicle as needed.
2. Diagnose and report the malfunction to the instructor.
3. If necessary, put on an occilascope.
4. Take necessary steps to repair the malfunction.
5. Check for leaks and operation.
6. Test-drive the vehicle.
7. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Analyze for moisture or foreign particle level in fuel system.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will remove the fuel tank or the carburetor bowl cover and clean moisture and dirt from the fuel system.

Evaluation Criterion:

The student will remove the tank or the carburetor bowl cover from the vehicle and clean out all the foreign matter, to the satisfaction of the instructor.

Performance Guide:

Fuel Tank:

1. Raise the vehicle on safety stands.
2. Disconnect the fuel line and sending unit wire. On some models, disconnect the vapor return line.
3. Remove the fuel tank.
4. Remove the sending unit and drain plug.
5. Drain the fuel tank and flush the tank with water and air.
6. Rinse with alcohol to remove any remaining moisture in the fuel tank.
7. Install the sending unit and drain plug.
8. Install the fuel tank.
9. Connect the fuel line and sending unit wire. Connect the vapor return line if necessary.
10. Check for leaks and sending unit operation.
11. Have the instructor check your work.

Carburetor:

1. Remove the air cleaner assembly.
2. Remove the carburetor bowl cover.
3. Remove the carburetor if dirt and moisture are prevalent.
4. Disassemble the carburetor, and place in carburetor cleaner.

DUTY: CARBURETOR AND EMISSION

TASK: Analyze for moisture or foreign particle level in fuel system.

Performance Guide (cont.):

5. After cleaning, reassemble the carburetor, replacing jets, power valve, gaskets and seals.
6. Calibrate the carburetor to the manufacturer's specifications.
7. Install the carburetor.
8. Start the vehicle, and adjust the mixture screws and curb idle screw, according to the specifications.
9. Test-drive the vehicle.
10. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Adjust choke unit, (automatic and manual).

Performance Objectives:

Given a vehicle with a manual choke, the necessary tools, equipment and a service manual, the student will adjust the manual choke to the manufacturer's specifications.

Evaluation Criterion:

The student will clean and adjust the manual choke mechanism to the instructor's satisfaction.

Performance Guide:

1. Remove the carburetor air cleaner.
2. Place the choke control (dash) fully "in".
3. Adjust the manual choke cable with the choke valve in full open position.
4. Check the manufacturer's specification for proper adjustment.
5. Clean all dirt from the choke unit, and place the air cleaner and dust bowl back in position.
6. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Inspect, clean and adjust choke unit (automatic and manual).

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will inspect, clean and adjust the automatic choke unit, checking for the sticking of the piston and freeness of linkage, to the manufacturer's specifications.

Evaluation Criterion:

The student will inspect, clean and adjust the automatic choke to the satisfaction of the instructor.

Performance Guide:

1. Remove the carburetor air cleaner.
2. Disassemble the automatic choke; clean the screen and unit.
3. Check the ticking of piston and freeness of linkage.
4. Reassemble the automatic choke.
5. Adjust the choke to the recommended setting.
6. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Replace gas tank sending unit.

Performance Objectives:

Given a vehicle with a faulty sending unit, the necessary tools, equipment and a service manual, the student will replace the fuel tank sending unit, following the manufacturer's recommendations.

Evaluation Criterion:

The student will replace the gas tank sending unit on the given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Place the vehicle on the safety stands.
2. Disconnect the full lines and sending unit wire.
3. Remove the fuel tank.
4. Clean off all dirt and particles that may fall into the fuel tank with air or brush.
5. Remove the sending unit.
6. Install the new sending unit.
7. Connect the ground wire between the tank and frame of the vehicle.
8. Connect the sending unit wire.
9. Check the dash unit for the proper operation.
10. Reinstall the fuel tank.
11. Lower the vehicle.
12. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Measure fuel flow and pressure.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will measure the pressure and flow of the fuel in the pump.

Evaluation Criterion:

The student will measure the pressure and flow of fuel in the pump to the satisfaction of the instructor.

Performance Guide:

1. Remove the air cleaner assembly.
2. Disconnect the fuel line at the carburetor.
3. Connect the fuel pressure and flow gauge to the fuel line, according to the manufacturer's specifications.
4. Crank with a starter or run the vehicle for a required time to check the proper fuel flow.
5. Compare the readings with the specifications.
6. If the readings do not meet the specifications, replace the fuel pump.
7. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Perform operational inspections of exhaust emission control system.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will inspect all the components of the emission control system and identify all malfunctions.

Evaluation Criterion:

The student will inspect all the components of the emission control system and report the defective components to the instructor.

Performance Guide:

1. Inspect the positive crankcase ventilating (PCV) system for vacuum leaks, poor connections and ease of operation, according to the manufacturer's specifications.
2. Inspect the improved combustion system (ICS) for vacuum leaks, poor connections and ease of operation.
3. Check the engine temperature control unit and spark advance, according to the manufacturer's specifications.
4. Inspect the air injection reactor (AIR) system for leaks, pressure build-up, relief valve operation, belt tension, hoses and manifold piping, according to the manufacturer's specifications.
5. Inspect the Orifice Spark Advance Control (OSAC) system for leaks, connections, filters, and spark advance, according to the manufacturer's specifications.
6. Check the gates and thermostatic valve for ease of operation.
7. Check the exhaust gas recirculating (EGR) system for operation, according to the manufacturer's specifications.
8. Check transmission controlled spark (TCS) system for operation, according to the manufacturer's specification. Make sure all connections are proper and functional.
9. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Perform operational inspections of evaporative emission control system.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will inspect the evaporative emission control system and repair or replace the faulty parts, according to the manufacturer's procedures.

Evaluation Criterion:

The student will inspect the evaporative emission control system on the given vehicle and make the necessary repairs to the satisfaction of the instructor.

Performance Guide:

1. Inspect the hoses and connections for leaks, cracks, routing or pinched conditions.
2. Inspect the carburetor percolating valve for operation.
3. Inspect the carbon cannister and replace the element, if necessary, according to the manufacturer's specifications.
4. Inspect the carbon cannister filter, and clean or replace if necessary.
5. Check any return lines to fuel tank or liquid reservoir for cracks, leakage and connections.
6. Check the fuel tank filler cap for leakage and sealing and replace if necessary.
7. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Service or repair manifold heat controls.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will inspect the manifold heat control units and repair or replace the units as necessary.

Evaluation Criterion:

The student will identify the problem and repair or replace the components in the manifold heat control units to the satisfaction of the instructor.

Performance Guide:

1. Check and determine the condition of the manifold heat stove.
2. Check the condition of the flexible tubing leading to the air cleaner.
3. Repair or replace as necessary.
4. Remove the bolts and nuts which hold the exhaust pipe to the exhaust manifold.
5. Remove the heat riser valve.
6. Using a suitable high-temperature, penetrating lubricant, free the butterfly valve with a hammer.
7. Check the thermostatic spring for operation after the valve is free. (Valve must close when cold and open when hot.)
8. Replace the valve if necessary.
9. Check the performance by accelerating rapidly and releasing the throttle.
10. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Remove and replace fuel pump.

Performance Objectives:

Given a vehicle with a malfunctioning fuel pump, the necessary tools, equipment and a service manual, the student will remove and replace the fuel pump, according to the manufacturer's recommendation.

Evaluation Criterion:

The student will remove the faulty fuel pump and replace it with a new one to the satisfaction of the instructor.

Performance Guide:

1. Disconnect the fuel lines from the fuel pumps.
2. Remove the mounting bolts holding the fuel pump.
3. Install the new fuel pump mounting gasket on the replacement pump.
4. Install the replacement pump. On some models, you must hold the activating rod up so that the pump will go in.
5. Connect the fuel line.
6. Start the vehicle and check for fuel leaks.
7. Test-drive the vehicle.
8. Have the instructor check your work.

DUTY: CARBURETOR AND EMISSION

TASK: Repair or replace fuel lines and hoses.

Performance Objectives:

Given a vehicle with defective hoses and fuel lines, the necessary tools and equipment, the student will repair or replace the fuel lines and hoses as needed.

Evaluation Criterion:

The student will identify the problem in the fuel lines and repair or replace the defective components, as necessary, to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle on the safety stands.
2. Disconnect the fuel lines from the fuel tank and inlet side of carburetor.
3. Remove the fuel lines from the frame area.
4. Inspect the fuel lines for leaks and damages.
5. Replace the flexible fuel line if necessary.
6. Repair or replace the flex line as required.
7. Disconnect the fuel line from the outlet side of the fuel pump to the carburetor.
8. Repair or replace the metal line as required.
9. Lower the vehicle and test-drive.
10. Have the instructor check your work.

AUTOMOTIVE MECHANICS

VI. STANDARD AND POWER STEERING (Service Mechanic)

Tasks covered in addition to those listed for mechanics helpers.

1. Adjust worm and sector in steering gear.
2. Replace steering spindles.
3. Inspect steering gear.
4. Inspect steering linkage.
5. Lubricate steering gear and linkage.
6. Adjust power steering units. Check power steering fluid level.
7. Rebuild power steering units.
8. Repair power steering pumps.
9. Replace power steering pumps.
10. Replace manual steering linkage components.
11. Replace manual steering gear components.
12. Replace power steering components.
13. Replace filter [illegible] power steering.

DUTY: STANDARD AND POWER STEERING

TASK: Adjust worm and sector in steering gear.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and service manual, the student will adjust the worm gear end play and hi-point according to the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the worm gear end play and hi-point in the given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle.
2. Disconnect the steering linkage or pitman arm.
3. Turn the steering wheel to the extreme travel, and check the worm gear end play.
4. Raise the hood and install the fender cover.
5. Adjust the worm gear end play, according to the manufacturer's specifications .
6. Center the steering.
7. Adjust the cross shaft adjusting screw to meet the manufacturer's specifications.
8. Tighten the lock nut.
9. Check and fill the steering gear to the proper fluid level.
10. Connect the steering linkage and/or the pitman arm.
11. Road-test for performance.
12. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Replace steering spindles.

Performance Objectives:

Given a vehicle with faulty steering spindles, a dial indicator, tools and service manual, the student will replace the steering spindles to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the defective steering spindles in the given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle.
2. Remove both front wheel assemblies.
3. For disc brakes, remove the front wheels and brake calipers.
4. Remove the rotor and hub assemblies.
5. Using a dial indicator, determine the need for the spindle replacement.
6. Remove and replace the spindles, according to the manufacturer's recommended procedures.
7. Pack the front wheel bearings with proper lubricant.
8. Replace the grease seals when necessary.
9. Install the wheel assemblies, and adjust the bearing to the specifications.
10. Check the specifications for wheel alignment.
11. For disc brakes, install the calipers and check the brake performance. Bleed the system if necessary.
12. Test-drive the vehicle.
13. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Inspect steering gear.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and service manual, the student will inspect the steering gear.

Evaluation Criterion:

The student will inspect the steering gear and locate the malfunctions to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle so that the front wheels are off the floor.
2. Check for signs of leakage, cross shaft seal wear and hi-pressure hoses.
3. With the left front wheel, turn the wheel in and out slowly through the entire travel of the steering gear, checking for signs of malfunction.
4. Check the gear adjustment by turning the steering wheel slowly through its straight ahead position for signs of slight drag or looseness. For power steering, start the engine.
5. Move the steering wheel back and forth in straight ahead position and check for the free play.
6. Have the instructor check your inspection procedures.

DUTY: STANDARD AND POWER STEERING

TASK: Inspect steering linkage.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will inspect the steering linkage on a given vehicle for wear.

Evaluation Criterion:

The student will inspect the steering linkage on the given vehicle and determine if the linkage meets the manufacturer's specifications, to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle so that the front wheels are off the floor and the suspension is supported under the outer ends of the lower control arms.
2. Starting with the left front wheel, shake the front wheels side to side and check for loose steering linkage components: steering arms; tie rod ends; relay rod; pitman arm; idler arm; and steering gear-to-frame mounting.
3. Repeat the step 2 procedure with the right front wheel.
4. Check the service manual to see if the linkage tolerance is within the specifications.
5. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Lubricate steering gear and linkage.

Performance Objectives:

Given vehicle lubrication equipment, the necessary tools and service manual, the student will lubricate the steering gear and steering linkage, according to the manufacturer's specifications.

Evaluation Criterion:

The student will lubricate the steering gear and steering linkage on the given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Refer to the vehicle's lubrication chart for proper gear lube requirements and lubrication points.
2. Raise the vehicle.
3. Wipe clean each lubrication zerk fitting on the steering linkage components.
4. Lubricate the components with correct chassis lube.
5. Check the steering gear fluid level.
6. Fill to the level recommended by the manufacturer.
7. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Adjust power steering units. Check power steering fluid level.

Performance Objectives:

Given a vehicle with power steering, the necessary tools, gauges, equipment and a service manual, the student will adjust the power steering unit to the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the power steering unit following the manufacturer's specifications.

Performance Guide:

1. Check the service manual for power steering unit adjustment procedures and specifications.
2. Raise the hood and install the fender covers.
3. Check the adjustments for looseness and for conformity with the manufacturer's specifications.
4. Make the necessary adjustment.
5. Check the fluid levels and the power steering hoses for signs of leaks.
6. Test the power steering for proper functioning.
7. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Rebuild power steering units.

Performance Objectives:

Given a power steering unit, the necessary replacement parts, tools, equipment, and a service manual, the student will rebuild the steering unit, according to the manufacturer's specifications and procedures.

Evaluation Criterion:

The student will rebuild the power steering to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for the power steering unit rebuilding procedures; disassembly procedures; tolerances; parts replacement; reassembly and adjustment procedures.
2. Drain the power steering unit of all fluid.
3. Disassemble the power steering unit, following the proper procedures.
4. Check for defective parts and wear tolerances.
5. Reassemble the unit with new replacement parts, following the recommended procedures.
6. Adjust the power steering unit, according to the manufacturer's specifications.
7. If a test bench is available, install the unit on the test bench; fill to the proper fluid level and operate at the proper hydraulic pressure.
8. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Repair power steering pumps.

Performance Objectives:

Given a malfunctioning power steering pump, the necessary tools, equipment, a service manual, and replacement parts, the student will repair the pump, according to the manufacturer's specifications.

Evaluation Criterion:

The student will disassemble the power steering pump, replace the malfunctioning parts and reassemble the power steering pump, to the satisfaction of the instructor.

Performance Guide:

1. Remove the pump rear mounting bolts and lift the reservoir from the housing.
2. Remove the end plate and spring.
3. Remove the pressure plate, pump ring, vanes and rotor.
4. Reassemble with replacement parts reversing steps 1-3.
5. Lubricate the outside diameter and chamber of the pressure plate with power steering fluid.
6. Lubricate the end plate, also.
7. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Replace power steering pumps.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will replace the power steering pump, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the power steering pump in a given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for the power steering pump removal and installation procedures, the belt tension specifications and lubrication requirements.
2. Raise the hood and install the fender covers. In some models, it may be necessary to loosen the air conditioning brackets.
3. Remove the power steering pump belt, and disconnect the hoses at the pump.
4. Remove and replace the power steering pump.
5. Install the belt and adjust to the proper tension.
6. Connect the hoses.
7. Fill the power steering pump with the proper lube to the correct level and bleed the system.
8. Check the pump operation and the fluid level at normal operating temperatures.
9. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Replace manual steering linkage components.

Performance Objectives:

Given a vehicle, the necessary tools, equipment, and a service manual, the student will replace the steering linkage components, according to the manufacturer's procedures.

Evaluation Criterion:

The student will replace the steering linkage components in a given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle so that the front wheels are off the floor.
2. Remove and replace the steering linkage components, according to the manufacturer's recommendation.
3. Lubricate the new components.
4. Check the tightness of locking bolts and/or installation of the cotter keys.
5. Arrange for the wheel alignment toe-in check, or perform the toe-in check on the vehicle, to the manufacturer's toe-in specifications.
6. Adjust the toe-in and center steering wheel position, if necessary.
7. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Replace manual steering gear components.

Performance Objectives:

Given a faulty manual steering gear, the necessary replacement parts, the tools, equipment and a service manual, the student will replace the defective steering gear components, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the defective steering gear components in the given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for the steering gear disassembly/assembly procedures and adjustment specifications.
2. Drain the lube from the steering gear.
3. Remove the cross shaft.
4. Remove the tube and worm gear.
5. Remove and replace the cross shaft bushings and seals: Horn bushings to fit the cross shaft, if necessary.
6. Install the worm bearings, the tube and worm gear.
7. Install the cross shaft and adjust the hi-point.
8. Refill the steering gear with lubricant to the specifications.

DUTY: STANDARD AND POWER STEERING

TASK: Replace power steering components.

Performance Objectives:

Given a vehicle with a defective power steering component, the necessary tools, equipment and a service manual, the student will locate the defect and replace the defective component, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the defective power steering component on a given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Inspect all steering components for leaks, damage and/or looseness.
2. Check the belt tension; oil level in the power steering pump; the steering action; and the oil pressure in the power steering system.
3. Locate the defective components.
4. Replace the parts, according to the manufacturer's recommendation.
5. Check for proper operation.
6. Have the instructor check your work.

DUTY: STANDARD AND POWER STEERING

TASK: Replace filter in power steering.

Performance Objectives:

Given a vehicle with power steering with a filter, the necessary tools and a service manual, the student will replace the filter, according to the manufacturer's procedures.

Evaluation Criterion:

The student will replace the filter in the power steering unit to the satisfaction of the instructor.

Performance Guide:

1. Disconnect the hoses from the power steering pump.
2. Remove the pump from the vehicle.
3. Clean the outside of the pump with solvent.
4. Remove the pulley retaining nut with appropriate tool.
5. Remove the union, O-ring seal, mounting studs, and reservoir.
6. Remove and replace the reservoir O-ring.
7. Replace the filter.
8. Reassemble the pump reversing steps 4-7.
9. Install the pump and hoses, and fill with proper power steering fluid.
10. Test for leaks and proper operation.
11. Have the instructor check your work.

VII. BRAKING SYSTEMS (Service Mechanic)

Tasks covered in addition to those listed for mechanics helpers.

1. Arc grind brake shoes.
2. Adjust parking brake linkage.
3. Adjust hand brake external band.
4. Replace hand brake external band.
5. Free-up parking brake cables.
6. Inspect and replace brake pads (disc brakes).
7. Inspect and turn rotor (disc brakes).
8. Inspect and refinish brake drums.
9. Inspect and replace self-adjusters.
10. Perform operational brake inspection.
11. Recondition backing plates.
12. Repair disc brake calipers.
13. Repair master cylinder.
14. Replace master cylinder.
15. Rebuild brake power units.
16. Repair self-adjusters.
17. Repair wheel cylinder.
18. Replace wheel cylinder.
19. Replace brake shoes.
20. Replace hydraulic control valves.
21. Replace hydraulic brake power units.
22. Replace hydraulic power cylinders.
23. Replace parking brake linkage.

DUTY: BRAKING SYSTEMS

TASK: Arc-grind brake shoes.

Performance Objectives:

Given a vehicle, the necessary tools, equipment, a service manual, and the machine operator's manual, the student will arc-grind the brake shoes to the matching drum diameters to meet the manufacturer's specifications.

Evaluation Criterion:

The student will arc-grind the brake shoes to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle so that the wheels are off the floor.
2. Remove all four or rear wheel assemblies.
3. Remove the brake shoes.
4. Check the grinder for calibration and proper abrasives.
5. Measure the brake drum diameter and adjust the brake shoe grinder according to the equipment manufacturer's procedures.
6. Mount the brake shoe on the machine using a proper attachment.
7. Arc-grind the shoes to the required arc.
8. Check the shoe-to-brake drum fit for the proper toe and heel clearances.
9. Reassemble the brakes and test for proper functioning.
10. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Adjust parking brake linkage.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will adjust the parking brake linkage to the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the parking brake linkage to the satisfaction of the instructor.

After adjustment, the hand brake will not drag or stick when placed in position or released.

Performance Guide:

1. Check the service manual for the proper procedures and specifications for hand-brake adjustment.
2. Raise the vehicle from the floor.
3. Disconnect the parking brake linkage.
4. Connect and adjust the linkage, according to the manufacturer's procedures.
5. Check the rear wheels for drag or free rotation when the hand brake is "off".
6. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Adjust hand brake external band.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will adjust the hand brake external band to the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the hand brake external band to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor.
2. Adjust the external band by tightening the screw, the centering bolt, and the adjusting nut, in this order, until a minimum clearance is obtained around the drum.
3. Check the drive shaft for free rotation with the hand brake "off".
4. Have the instructor check your work.

DUTY: MAINTAINING AND REPAIRING BRAKING SYSTEM

TASK: Replace hand brake external band.

Performance Objectives:

Given a vehicle, the necessary tools, equipment, and a service manual, the student will replace the hand brake external band to meet the manufacturer's specifications.

Evaluation Criterion:

The student will replace the hand brake external band on a given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for the proper service procedures.
2. Raise the vehicle from the floor.
3. Disconnect the hand brake linkage and remove the external band.
4. Install the external band and adjust to the manufacturer's specifications.
5. Adjust the hand brake cable.
6. Test the hand brake for proper functioning.
7. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Free-up parking brake cables.

Performance Objectives:

Given a vehicle with corroded parking brake cables, the necessary tools, equipment, lubricants and a service manual, the student will free-up the parking brake cables.

Evaluation Criterion:

The student will lubricate the parking brake cables so that the parking brake operates freely.

Performance Guide:

1. Raise the vehicle from the floor.
2. Disconnect the cables; remove the rear wheels, as required.
3. Free-up the cables using lubricants, as necessary, to obtain easy movement.
4. Reconnect the cables and test the parking brake for proper functioning.
5. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Inspect and replace brake pads (disc brakes).

Performance Objectives:

Given a vehicle with disc brakes, the necessary tools, equipment and a service manual, the student will inspect the brake pads for thickness and replace the pads, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the disc brake pads on the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Check the manufacturer's service manual for the disc brake pad thickness specifications and replacement procedures.
2. Raise the vehicle from the floor.
3. Remove the front wheels from the vehicle.
4. Check the shoe pad thickness.
5. Remove the disc brake caliper: If the rotor is damaged, remove it, so it can be turned down on a brake lathe.
6. Replace the shoe pads and reinstall the proper bolt tightening torque valves.
7. Check the brake pedal operation.
8. Reinstall the front wheels and torque to the specifications.
9. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Inspect and turn rotor (disc brakes).

Performance Objectives:

Given a vehicle with disc brakes, the necessary gauges, tools, equipment, and a service manual, the student will inspect and refinish the rotor to the manufacturer's specifications.

Evaluation Criterion:

The student will turn the rotor to meet the approval of the instructor.

Performance Guide:

1. Check the service manual for the disc brake rotor specifications and removal/installation procedures.
2. Locate the disc brake lathe operating information in the manual.
3. Raise the vehicle from the floor.
4. Check the front wheel bearing adjustment.
5. Remove the front wheel.
6. Check the disc brake rotor lateral runout.
7. Check the rotor thickness and parallel, if necessary.
8. Remove the caliper rotor; mount the rotor to the lathe and refinish to the manufacturer's specifications.
9. Reinstall the rotor to the vehicle.
10. Road test the vehicle.
11. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Inspect and refinish brake drums.

Performance Objectives:

Given a set of brake drums, the proper micrometer, equipment and tools, the student will inspect and refinish the brake drums to the manufacturer's specifications.

Evaluation Criterion:

The student will inspect and refinish the brake drums to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for drum diameter specifications and the drum lathe manufacturer's operating procedures.
2. Inspect the brake drums and measure the drum diameters.
3. Mount the drum on the drum lathe.
4. Operate the lathe, according to the manufacturer's procedures. Follow accepted safety practices.
5. Refinish the drum to the manufacturer's specifications.
6. Repeat the above steps to refinish the remaining drums.
7. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Inspect and replace self-adjusters.

Performance Objectives:

Given a vehicle with self-adjusting drum brakes, the necessary equipment and special brake tools, the student will inspect and replace the self-adjusters, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will remove and replace the self-adjusters to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor.
2. Remove all four or the two rear wheel assemblies.
3. Remove the brake shoes, star wheel adjuster, self-adjusting components, and backing plate bosses.
4. Inspect, clean and lubricate the star wheel adjusters, self-adjusting components, and backing plate bosses.
5. Install the brake shoes and self-adjusters.
6. Reinstall the drums and wheel. Adjust the brakes.
7. Check the brake pedal operation.
8. Road test the vehicle and make a final adjustment of the brakes.
9. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Perform operational brake inspection.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will perform an operational brake inspection, according to the manufacturer's procedures to meet the tolerance specifications.

Evaluation Criterion:

The student will perform an operational brake inspection to the satisfaction of the instructor.

Performance Guide:

1. Check the brake pedal operation.
2. For power brakes, step on the brake pedal and start the engine.
3. Drive the vehicle forward and apply brakes: Watch for erratic brake action; squeal; and pulling to one side.
4. Raise the hood.
5. Install the fender cover and check the master cylinder fluid level and signs of leakage.
6. Remove all four wheels and wheel assemblies.
7. Check all brake components: Record the results.
    a. Check for shoe linings being thin, cracked or glazed.
    b. Check for leaking wheel cylinders and broken springs.
8. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Recondition backing plates.

Performance Objectives:

Given a vehicle with defective brake backing plates, the necessary tools, equipment, and a service manual, the student will recondition the brake backing plates, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will recondition the backing plates to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for proper service procedures.
2. Raise the vehicle from the floor.
3. Remove the wheels, drums and brake shoes.
4. Remove the backing plates, if necessary.
5. Recondition or dress the backing plate bosses.
6. Lubricate and reinstall the brake shoes and wheels.
7. Readjust the brakes and bleed the hydraulic system, if necessary.
8. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Repair disc brake calipers.

Performance Objectives:

Given a vehicle with a problem in the disc brake caliper, the necessary tools, equipment and a service manual, the student will repair the disc brake caliper, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will repair the faulty disc brake caliper on the given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor.
2. Remove the wheels and loosen the caliper hydraulic brake hose.
3. Remove the caliper. Drain the brake fluid into the pan.
4. Disassemble the caliper: Dust boots, piston, and square-cut seals.
5. Wash the caliper with brake fluid.
6. Polish the bore with crocus cloth.
7. Check the piston fit.
8. Using assembly fluid or brake fluid, install the seals, pistons and boots.
9. Reinstall the caliper to the proper torque specifications.
10. Bleed the caliper and check the master cylinder fluid levels.
11. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Repair master cylinder.

Performance Objectives:

Given a master cylinder with a malfunction, the necessary tools, equipment and a service manual, the student will pair the master cylinder to the manufacturer's specifications.

Evaluation Criterion:

The student will locate the problem and repair the master cylinder to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for proper repair procedures and specifications.
2. Drain the master cylinder of brake fluid and disassemble the master cylinder.
3. Clean and hone the cylinder, checking the proper piston fit.
4. Install new parts and reassemble the master cylinder.
5. Fill with proper brake fluid and bench-bleed, if necessary.
6. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Replace master cylinder.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will remove and replace the brake master cylinder, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the brake master cylinder on the given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the hood and install the protective fender covers.
2. Disconnect the master cylinder.
3. Push the rod from the brake pedal and hydraulic brake lines.
4. Remove the mounting bolts and master cylinder from the firewall.
5. Bench-bleed the new master cylinder, if necessary.
6. Fill to the recommended fluid level.
7. Install the master cylinder reversing steps 2 - 4.
8. Check and adjust the brake pedal free play, to the manufacturer's specifications.
9. Check the brake pedal operation.
10. Bleed the master cylinder lines and/or the wheel cylinders, if necessary.
11. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Rebuild power brake units.

Performance Objectives:

Given a vehicle with faulty power brakes, the necessary tools, equipment and a service manual, the student will rebuild the hydraulic brake power unit, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will rebuild the hydraulic power brake units to the satisfaction of the instructor.

Upon completion, the brake system will have no leaks or air in the lines.

Performance Guide:

1. Check the service manual for proper rebuilding procedures and specifications.
2. Scribe the line across the front and rear housings.
3. Remove the front housing seal.
4. Rotate the rear housing counterclockwise to unlock the housings.
5. Remove the rear housing and power piston assembly.
6. Disassemble the power brake unit.
7. Install the replacement parts in reverse order and reassemble the unit.
8. Test the hydraulic power brake unit on the test bench, if possible.
9. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Repair self-adjusters.

Performance Objectives:

Given a vehicle with faulty self-adjusters, the necessary tools, equipment, and a service manual, the student will repair the self-adjusters, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will locate the malfunction and repair the necessary components in the brake self-adjusters to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor.
2. Remove the wheels, drums, brake shoes, and self-adjusters.
3. Inspect, clean and lubricate the self-adjusters and backing plate bosses.
4. Reinstall the self-adjusters, brake shoes, drums and wheels.
5. Readjust the brake shoes.
6. Check the brake pedal operation.
7. Road test the vehicle and make the final adjustment of the brakes.
8. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Repair wheel cylinder.

Performance Objectives:

Given a vehicle with a defective brake wheel cylinder, the necessary tools, equipment and a service manual, the student will rebuild the wheel cylinder, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will rebuild the wheel cylinder to the satisfaction of the instructor.

Performance Guide:

1. Check the bleeder to make sure it will open.
2. Drain all brake fluid from the wheel cylinder into the waste can.
3. Disassemble the wheel cylinder, removing the dust boots, pistons, hydraulic cups and springs.
4. Remove the bleeder screw.
5. Clean and polish the cylinder with crocus cloth.
6. Hone the cylinder when allowed.
7. Measure the cylinder diameter and/or piston fit, according to the manufacturer's recommendations.
8. Reassemble the wheel cylinder, using new parts.
9. Clean the bleeder screw and reinstall.
10. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Replace wheel cylinder.

Performance Objectives:

Given a vehicle with a defective wheel cylinder, the necessary tools, equipment and a service manual, the student will remove and replace the defective wheel cylinder, according to the manufacturer's recommendations.

Evaluation Criterion:

The student will replace the defective wheel cylinder to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor.
2. Remove the wheel assembly.
3. Remove the brake shoes and disconnect the hydraulic line to the wheel cylinder.
4. Remove the wheel cylinder mounting bolts and wheel cylinder from the backing plate.
5. Install the new wheel cylinder, and reassemble the brake shoes and wheel assembly.
6. Check the brake adjustment and the master cylinder fluid level.
7. Bleed the wheel cylinder.
8. Check the brake pedal operation and road test the vehicle.
9. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Replace brake shoes.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will replace the worn brake shoes, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the brake shoes on the given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for proper brake shoe replacement procedures.
2. Raise the vehicle from the floor.
3. Remove the wheels and drums.
4. Remove the old brake shoes.
5. Clean the brake backing plates and lubricate the backing plate hoses.
6. Arc-grind the new brake shoes to fit the drum diameters.
7. Install the brake shoes, following the recommended procedures.
8. Reinstall the drums and wheels.
9. Adjust the brake shoes.
10. Check the brake pedal operation.
11. Road test the vehicle and make the final adjustments to the brakes.
12. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Replace hydraulic control valves.

Performance Objectives:

Given a vehicle with defective hydraulic control valves in the brake system, the necessary tools, equipment and a service manual, the student will replace the valves, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will remove the old hydraulic control valves and replace with new ones to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor, if necessary.
2. Disconnect the hydraulic lines from the defective hydraulic control valve and from any electrical connections.
3. Remove the mounting bolts and the valve from the vehicle.
4. Install the new valve reversing steps 2 and 3.
5. Bleed the hydraulic lines at the fittings.
6. Check the brake pedal operation.
7. Road test the vehicle for proper braking.
8. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Replace hydraulic brake power units.

Performance Objectives:

Given a vehicle with a defective hydraulic brake power unit, the necessary tools, equipment and a service manual, the student will replace the unit, according to the manufacturer's recommendations.

Evaluation Criterion:

The student will replace the hydraulic brake power unit to the satisfaction of the instructor.

Performance Guide:

1. Raise the hood and install the protective fender covers.
2. Disconnect the vacuum lines and remove the vacuum check valve.
3. Remove the master cylinder, and position away from the power cylinder.
4. Remove the clevis pin retainer at the brake pedal.
5. Remove the power/unit-to-dash attaching nuts.
6. Remove the power unit.
7. Install a new power unit reversing steps 2 - 5.
8. Check the brake pedal free play and adjust if necessary.
9. Check the brake pedal operation.
10. Road test the vehicle.
11. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Replace hydraulic power cylinders.

Performance Objectives:

Given a vehicle with a defective hydraulic cylinder, the necessary tools, equipment and a service manual, the student will replace the hydraulic power cylinder, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the hydraulic power cylinder in a given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the hood and install the protective fender cover.
2. Disconnect the vacuum lines. Remove the vacuum check valve.
3. Remove the master cylinder, and position away from the power cylinder.
4. Remove the clevis pin retainer at the brake pedal.
5. Remove the power unit-to-dash attaching nuts.
6. Remove the power cylinder.
7. Install the new power cylinder reversing steps 2 - 5.
8. Check the brake pedal free play and adjust, if necessary.
9. Check the brake pedal operation.
10. Road test the vehicle.
11. Have the instructor check your work.

DUTY: BRAKING SYSTEMS

TASK: Replace the parking brake linkage.

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will replace the hand (parking) brake linkage, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the parking brake linkage to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor.
2. Place the parking (hand) pedal in release position.
3. For the rear cables:
    a. Remove the rear wheels, drums, and brake shoes.
    b. Disconnect the cables at the equalizer.
4. For the front cables:
    a. Separate the cable stud from the equalizer.
    b. Remove the end of the cables from the pedal clevis.
    c. Remove the mounting bolts and/or clips.
    d. Withdraw the cable.
5. Install the brake shoes, the pedal clevis and/or rear brake shoes.
6. Install the brake shoes, drums, and wheels.
7. Adjust the handbrake cables.
8. Check the adjustment: The rear wheels must turn freely without drag with the parking brake "off".
9. Have the instructor check your work.

AUTOMOTIVE MECHANICS

VIII. FRONT ENDS (Service Mechanic)

Tasks covered in addition to those listed for mechanics helpers.

1. Adjust torsion bars.
2. Replace torsion bars.
3. Adjust front wheel bearing. Inspect wheel bearings.
4. Balance wheels and tires.
5. Check and align front end.
6. Inspect and replace steering damper.
7. Perform visual inspections of the suspension systems.
8. Inspect and repair front suspension systems.
9. Rebush king pins or link pins.
10. Repair rear suspension systems.
11. Replace ball joints.
12. Replace front wheel bearing grease seal.
13. Replace front suspension control arms and bushings.
14. Replace rear suspension systems.

DUTY: FRONT ENDS

TASK: Adjust torsion bars

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will adjust the torsion bars to the manufacturer's specifications.

Evaluation Criterion:

The student will adjust the torsion bars to the satisfaction of the instructor.

Performance Guide:

1. With the vehicle placed on a level surface, install torsion bar height gauges on the lower control arms.
2. Adjust the torsion bars at adjusting ends until the recommended heights are obtained.
3. Settle the front of the vehicle and recheck the vehicle height readings.
4. Have the instructor check your work.

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DUTY: FRONT ENDS

TASK: Replace torsion bars

Performance Objectives:

Given a vehicle, the necessary tools, equipment and a service manual, the student will remove and replace the torsion bars, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the torsion bars on the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor and support it with stands, following safety practices.
2. Lift the vehicle body to extend the lower control arms in full rebound position.
3. Release all load from the torsion bar by turning the anchor adjusting bolt counterclockwise.
4. Remove the torsion bars by sliding the bar out through the rear of rear anchor.
5. Install new torsion bars reversing steps 1 - 4. Check the marking on the torsion bars for the correct installation.
6. Adjust the torsion bar to the height specifications.
7. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Adjust front wheel bearing. Inspect wheel bearings.

Performance Objectives:

Given a vehicle, cotter pins, the necessary tools, equipment and a service manual, the student will adjust the front wheel bearings to the manufacturer's specifications.

Evaluation Criterion:

Adjust the front wheel bearings on the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the front of the vehicle from the floor and support it with stands, following safety practices.
2. Remove the hub and dust caps and cotter pins from the spindle nuts.
3. Adjust the front wheel bearings, following the manufacturer's recommended procedures.
4. Install new cotter pins properly.
5. Install the dust and hub caps.
6. Have the instructor check your work.
7. Lower the vehicle to the floor.

DUTY: FRONT ENDS

TASK: Balance wheels and tires.

Performance Objectives:

Given a vehicle with unbalanced wheels, wheel weights, the necessary tools and equipment, and a service manual, the student will balance the wheels and tires, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will balance the wheels on an automobile to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor and support it in a safe manner to balance the wheels on the vehicle.
2. Prepare the wheel and tires: Check the air pressure; inspect for cuts; remove stones and old wheel weights.
3 Balance the wheels following the operating procedures.
4. Check wheel weights for secure installation.
5. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Check and align front end.

Performance Objectives:

Given a vehicle with the front end out of alignment, the necessary tools, equipment, and service manual, the student will check the wheel alignment angles and align the front wheel to the manufacturer's specifications.

Evaluation Criterion:

The student will align the front wheels to the satisfaction of the instructor.

Performance Guide:

1. Place the vehicle on the wheel alignment rack or front wheels on the turning radius gauges.
2. Place the front wheels in a straight-ahead direction and install the pedal depressor to lock the brakes of all four wheels.
3. Check the air pressure in the tires, all steering components, tie rod ends, pitman arm, idler arm and balljoints.
4. Install or attach the wheel alignment clamps and/or gauges to the front wheel, and measure the caster, camber steering axis inclinator, turning radius and toe-in angles.
5. Adjust the wheel alignment angles to the recommended settings.
6. Road test the vehicle.
7. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Inspect and replace steering damper.

Performance Objectives:

Given a vehicle with a malfunctioning steering damper, the necessary tools, equipment and a service manual, the student will remove and replace the steering damper, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will remove and replace the defective steering damper to the satisfaction of the instructor.

Performance Guide:

1. Raise the front of the vehicle and support it in a safe manner.
2. With the front wheels in a straight-ahead direction, disconnect the steering damper from the steering age.
3. Disconnect the steering damper from the frame mounting.
4. Install the new steering damper, following steps 2-3 in reverse order.
5. Tighten the connections to the recommended torque specifications.
6. Check the damper operation throughout the steering gear travel in both left and right directions.
7. Road test the vehicle.
8. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Perform visual inspections of the suspension systems.

Performance Objectives:

Given a vehicle with visual signs of suspension problems, the student will visually inspect the front and rear suspension components and the vehicle sag conditions, as specified by the manufacturer.

Evaluation Criterion:

The student will inspect the suspension components and report on the components needing repair or replacement, to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle to the proper working height to allow the visual inspection of the front suspension components.
2. Note and record any suspension parts that show an obvious defect: the worn-out ball-joint dust boots; control arm bushing; or any other bent, loose or worn parts.
3. Have the instructor check your findings.

DUTY: FRONT ENDS

TASK: Inspect and repair front suspension systems.

Performance Objectives:

Given a vehicle with defective suspension components, the necessary tools, equipment, and a service manual, the student will remove and replace the defective front suspension and steering components, following the manufacturer's specifications.

Evaluation Criterion:

The student will identify the defective suspension components and make the necessary repairs to the satisfaction of the instructor.

Performance Guide:

1. Raise the front of the vehicle from the floor and support, following safety practices.
2. Check the steering and front suspension systems for worn or loose parts.
3. Record the findings.
4. Repair or replace those components needing attention following the recommended procedures.
5. Lubricate the new components.
6. Have the instructor check your work.
7. Arrange for the wheel alignment check and adjustment.

DUTY: FRONT ENDS

TASK: Rebush king pins or link pins.

Performance Objectives:

Given a vehicle with defective king pins, the necessary tools, equipment and a service manual, the student will rebush the king pins, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will rebush the king pins and reinstall them in the vehicle, to the satisfaction of the instructor.

Performance Guide:

1. Raise the front of the vehicle and support it, following safety practices.
2. Remove the front wheel assemblies and brake backing plates from the steering knuckles.
3. Remove the king-pin locking pins, upper and lower dust/grease cups, snap rings, etc.
4. Drive-out the king pins and separate the steering knuckles from the axle eye.
5. Rebush the steering knuckles and hone to fit the new king pins, if necessary.
6. Install the steering knuckles and new king pins on the vehicle.
7. Install the locking pins, grease cups and snap rings.
8. Install the brake backing plates to the steering knuckles and reinstall the front wheel assemblies.
9. Lubricate the new king pins and bushings.
10. Have the instructor check your work.

DUTY: MAINTAINING AND REPAIRING FRONT ENDS

TASK: Repair rear suspension systems.

Performance Objectives:

Given a vehicle with a problem in the rear suspension, the necessary tools, equipment and a service manual, the student will locate and repair or replace the defective rear suspension components, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will locate the problem in the rear suspension and make the necessary repairs to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor and support it, following safety practices.
2. Inspect the rear suspension for loose, worn and/or broken components.
3. Record the results and report to the instructor.
4. Remove and replace the defective links, bushings, springs, shock absorbers, shackles, center bolts, and/or stabilizer bar and links, as necessary.
5. Raise and lower the vehicle body from the suspension, as needed.
6. Have the instructor check your repair.

DUTY: FRONT ENDS

TASK: Replace ball joints.

Performance Objectives:

Given a vehicle, replacement ball joints, the necessary tools, equipment, and a service manual, the student will replace the upper and lower ball joints to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the upper and lower ball joints to the satisfaction of the instructor.

Performance Guide:

1. Raise the front of the vehicle from the floor and support it, following safety practices.
2. Remove the front wheel assemblies.
3. With jack support under the lower control arm, remove the cotter pins and ball-joint stud nuts.
4. Separate the ball joints from the spindle support arm with proper tools and equipment.
5. Remove the ball joints from the control arms using proper tools and equipment.
   a. On some models, rivets may be holding the ball joints in: The rivets must be chiseled off and then drilled partially out.
   b. On other models, the ball joints are either bolted in or pressed in.
6. Install new ball joints, using proper tools and equipment for the control arms.
7. Attach the ball joints to the spindle support arm and tighten to the proper torque specifications.
8. Lubricate the new ball joints and reinstall the wheel assemblies.
9. Check the front wheel alignment.
10. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Replace front wheel bearing grease seal.

Performance Objectives:

Given a vehicle with a problem in the front wheel bearing grease seals, a service manual, the necessary tools and equipment, the student will replace the seals, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the front wheel bearing grease seals to the satisfaction of the instructor.

Performance Guide:

1. Raise the front of the vehicle from the floor and support the vehicle, following safety practices.
2. Remove the front wheel assemblies.
3. Remove the inner wheel bearings and grease seals.
4. Before putting the wheel bearings in, clean the bearings, inspect them and repack them.
5. Install the wheel assemblies, outer wheel bearings and spindle nut.
6. Adjust the front wheel bearings to the manufacturer's specifications.
7. Install the cotter pins and dust and hub caps.
8. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Replace front suspension control arms and bushings.

Performance Objectives:

Given a vehicle, replacement parts, the necessary tools, equipment and a service manual, the student will replace the front suspension control arms and bushings to meet the manufacturer's specifications.

Evaluation Criterion:

The student will replace the front suspension control arms and bushings on the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor and support it, following safety practices.
2. Remove the front wheel assemblies.
3. With support jack under the lower control arms, disconnect the lower ball joints from the spindle-support arms.
4. Disconnect the shock absorbers: strut rods: stabilizer bar links.
5. Remove the lower control arm and replace the inner bushings.
6. Reinstall the lower control arms and coil springs, if required.
7. Disconnect the upper ball joints from the spindle support arm.
8. Remove the upper control arms and replace the inner bushings.
9. Reinstall the upper control arms and reconnect the ball joints to spindle support arms.
10. Install front wheel assemblies.
11. Have the instructor check your work.

DUTY: FRONT ENDS

TASK: Replace rear suspension systems.

Performance Objectives:

Given a vehicle with a faulty rear suspension, the necessary tools, equipment, and a service manual, the student will replace the defective or worn rear suspension parts, according to the manufacturer's specifications.

Evaluation Criterion:

The student will remove and replace all defective or worn components of the rear suspension system to the satisfaction of the instructor.

Performance Guide:

1. Raise the vehicle from the floor and support it, following safety practices.
2. Lift the vehicle body from the rear suspension and support.
3. Remove the stabilizer bar links and bar: Disconnect the rear shock absorbers at the lower ends; disconnect the arm limbs at the frame or U-bolts of the leaf springs.
4. Lower the rear suspension and remove coil springs.
5. Remove the leaf springs.
6. Install the rear suspension components.
7. Assemble the rear suspension reversing steps 3-6.
8. Have the instructor check your work.

IX. COOLING SYSTEMS (Service Mechanic)

Tasks covered in addition to those listed for mechanics helpers.

1. Check coolant temperature.
2. Check overflow tank.
3. Chemically clean and flush cooling system.
4. Perform chemical test on cooling systems.
5. Pressure-test cooling system.
6. Solder minor leaks in radiators.
7. Test thermostat.
8. Replace thermostat.

DUTY: COOLING SYSTEMS

TASK: Check coolant temperature.

Performance Objectives:

Given a vehicle with the engine running for at least 10 minutes and a thermometer, the student will record the temperature of the cooling solution.

Evaluation Criterion:

The student will check and record the coolant temperature in the given vehicle within ± 5° of the instructor's reading.

Performance Guide:

1. Determine if the coolant in the radiator is at the proper level.
2. Place the thermometer in the radiator making sure that it is in contact with the coolant.
3. After the thermometer has remained in place long enough to obtain a stable reading, record the temperature.
4. Have the instructor check your reading.

DUTY: COOLING SYSTEMS

TASK: Check overflow tank.

Performance Objectives:

Given a vehicle with an overflow tank, the student will check the tank for proper operation and mounting as specified in the service manual.

Evaluation Criterion:

The student will check the overflow tank on the vehicle and identify the malfunctions to the satisfaction of the instructor.

Performance Guide:

1. Inspect the overflow tank, hoses and connections for condition and installation.
2. Pressure-test the cooling system and radiator cap.
3. Determine if the coolant level is correct in the radiator and overflow tank.
4. Run engine to normal operating temperature.
5. Stop the engine and allow ample time for the cooling system to reach ambient temperature.
6. Check the operation of the overflow tank system.
7. Have the instructor check your procedure.

DUTY: COOLING SYSTEMS

TASK: Chemically clean and flush cooling system.

Performance Objectives:

Given a liquid cooled engine, the necessary tools, equipment and a chemical cleaner, the student will chemically clean and flush the cooling system, following the manufacturer's recommended procedures.

Evaluation Criterion:

The student will chemically clean and flush the cooling system to the satisfaction of the instructor.

Performance Guide:

1. Check the instructions for the chemical product.
2. Following those instructions, clean the cooling system with the chemical.
3. Check the service manual for flushing procedures for the cooling system.
4. Flush the complete cooling system.
5. Reinstall hoses and thermostat after flushing, as required, and check all connections.
6. Fill the system to the required level with the proper coolant.
7. Pressure-test the cooling system to be sure that there are no leaks.
8. Run the engine to the operating temperature and recheck the coolant level.
9. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Perform a chemical test on cooling systems.

Performance Objectives:

Using a chemical tester, the student will perform a cylinder leakage test on the cooling system of the given vehicle, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will perform a chemical test on the cooling system and identify any leaks found, to the satisfaction of the instructor.

Performance Guide:

1. Check the test procedures as outlined by the chemical tester manufacturer.
2. CAUTION: Adjust the coolant level so that no liquid can be drawn into the tester.
3. Test the system for cylinder leakage, following the prescribed procedures, with the engine operating cold, and again at the normal operating temperature.
4. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Pressure-test a cooling system.

Performance Objectives:

Given a liquid cooled engine and a pressure tester, the student will test a cooling system including the radiator cap.

Evaluation Criterion:

The student will pressure-test the cooling system and identify all the leaks to the satisfaction of the instructor.

Performance Guide:

1. Remove the radiator cap.
2. Install the radiator tester.
3. Using a pressure pump, apply the specified pressure to the cooling system.
4. While under pressure, check for leaks to hoses, expansion plugs, water pump, radiator and all cooling components.
5. Note the pressure drop on the gauge, if any.
6. Using an adapter, install the radiator cap on the pressure pump and adapter.
7. Using a pressure pump, apply the specified pressure to cap: The required pressure may be found on the top side of the radiator cap.
8. Note the pressure required to unseat the relief valve.
9. Note any pressure drop below the specified pressure.
10. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Solder minor leaks in radiators.

Performance Objectives:

Given a radiator with minor leaks, soldering equipment and a service manual, the student will make the required solder repairs to meet industrial standards.

Evaluation Criterion:

The student will identify the leaks and repair them with solder to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for the radiator removal and installation procedures.
2. Following the outlined procedures, remove the radiator.
3. Pressure-test the radiator to locate the leak.
4. Clean the area to be repaired and make the needed solder repair.
5. Pressure-test the radiator to check the repair.
6. Reinstall the radiator.
7. Fill the cooling system to the required level with the proper coolant.
8. Pressure-test the cooling system for leaks.
9. Run the engine to the normal operating temperature and recheck the coolant level.
10. Have the instructor check your work.

DUTY: COOLING SYSTEMS

TASK: Test thermostat.

Performance Objectives:

Using a thermostat test, the student will test the thermostat for proper operation, as specified by the manufacturer.

Evaluation Criterion:

The student will test the thermostat for proper operation and report the temperature reading to the instructor.

Performance Guide:

1. Place the container with water on a suitable heating element (hot plate, stove, bunsen burner, etc.).
2. Place the thermometer in the water.
3. Place the thermostat in the water.
4. Heat water until the thermostat begins to open: Note the water temperature and report it to the instructor.

DUTY: COOLING SYSTEMS

TASK: Replace thermostat.

Performance Objectives:

Given a liquid cooled engine, the student will remove and replace the thermostat, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the thermostat on the given vehicle to the satisfaction of the instructor.

Performance Guide:

1. Remove any objects that prevent access to the thermostat housing.
2. Remove the thermostat housing and thermostat.
3. Clean the gasket surfaces.
4. Install the thermostat and housing, using a new jacket.
5. Install any objects that were removed for access.
6. Fill the cooling system to the required level with the proper coolant.
7. Pressure-test the system for leaks.
8. Run the engine to the normal operating temperature and recheck the coolant level.

X. HEATERS

Tasks covered in addition to those listed for mechanics helpers.

1. Diagnose heating system malfunctions.
2. Replace heater control units.
3. Remove and replace heater core.
4. Repair heater core.
5. Service heater control components.

DUTY: HEATERS

TASK: Diagnose heating system malfunctions.

Performance Objectives:

Given a vehicle with problems in the heating system, the necessary tools and equipment, the student will test the heating system and identify the malfunctions.

Evaluation Criterion:

The student will inspect the heating system and report the specific problems to the instructor.

Performance Guide:

1. Bring the vehicle to the normal operating temperature.
2. Turn on the blowers and check for the operation and volume.
3. Move the temperature selector lever to various positions and check the proper operation.
4. Check the heater output in the closed and wide open positions.
5. Check the heater control valve for proper operation.
6. Check the heater hoses (coolant) and ducting for cracks, leaks and fastenings.
7. Report your findings to the instructor.

DUTY: HEATERS

TASK: Replace heater control units.

Performance Objectives:

Given the necessary tools and equipment, the student will replace the heater control unit, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will remove the defective part and replace it with a new heater control unit to the satisfaction of the instructor.

Performance Guide:

1. Remove the fasteners which hold the control unit to the dash.
2. Reach under the dash and pull the control unit out.
3. Remove the control cables from the old unit, one at a time, and attach them to the new control unit.
4. Put the new unit back into proper position under the dash.
5. Replace the fasteners to attach the control unit to the dash.
6. Operate the heater and check the control units for proper functioning.
7. Have the instructor check your work.

DUTY: HEATERS

TASK: Remove and replace heater core.

Performance Objectives:

Given the necessary tools and a service manual, the student will remove and replace the heater core, according to the manufacturer's recommended procedure.

Evaluation Criterion:

The student will remove the old heater core and install a new one in the vehicle, to the satisfaction of the instructor.

Performance Guide:

1. Drain the radiator.
2. Remove the heater hoses at the heater.
3. Remove the cable and electrical connectors from the heater.
4. On the engine side of the dash, remove the retaining fasteners holding the heater assembly.
5. Inside the vehicle, pull the entire heating assembly out of the dash.
6. Remove the heater core fasteners and remove the core.
7. Replace the core, reversing steps 1-6.
8. Have the instructor check your work.

DUTY: HEATERS

TASK: Repair a heater core.

Performance Objectives:

Given the necessary tools and equipment, the student will repair a leaky heater core, according to industrial standards.

Evaluation Criterion:

The student will identify the problem in the heating core and make the necessary repairs, to the satisfaction of the instructor.

Performance Guide:

1. Pressure-test the heater core to determine the area of the leaks.
2. Make the necessary adjustments to the water inlet and outlet tubes.
3. Straighten any damaged or bent cooling fins.
4. Using the proper soldering equipment, repair the leak under the instructor's supervision.
5. Pressure-test the heater core, using the specified pressure.

DUTY: HEATERS

TASK: Service heater control components.

Performance Objectives:

Given a vehicle, the service manual, the necessary tools and equipment, the student will service the heater control components, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will service the heater control to eliminate any existing problems, to the satisfaction of the instructor.

Performance Guide:

1. Locate all heater control units.
2. Re-route and straighten any cables where needed.
3. Adjust the doors and cables to meet the manufacturer's specifications.
4. Lubricate all hinge areas and check for freedom of operation.
5. Check the vacuum source and the unit operation.
6. Observe the operation of all components through all phases.
7. Have the instructor check your work.

AUTOMOTIVE MECHANICS

XI. AUTOMOBILE AIR CONDITIONERS

Tasks covered in addition to those listed for mechanics helpers.

1. Install air conditioners in vehicles.
2. Diagnose malfunctions in air conditioning.
3. Evacuate air conditioning system.
4. Inspect and recharge system with refrigerant.
5. Pressure-test system.
6. Leak-test system.
7. Repair air conditioning compressor.
8. Replace air conditioning compressor.
9. Repair electrical circuits.
10. Repair vacuum circuits.
11. Replace condenser in air conditioning unit.
12. Replace compressor seals.
13. Replace air conditioner fan motor.
14. Replace evaporator in air conditioning unit.
15. Replace drier in air conditioning unit.
16. Replace expansion valve in air conditioning units.
17. Replace evaporator control valve or diaphragm in air conditioning unit.
18. Service air conditioner control cables.
19. Repair automatic air conditioning and heater systems.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Install air conditioners in vehicles.

Performance Objectives:

Given the necessary tools, equipment, and a service manual, the student will install an air conditioning unit in the assigned vehicle to the manufacturer's specifications.

Evaluation Criterion:

The student will install an air conditioner in the vehicle, to the satisfaction of the instructor.

When installed, the air conditioner will operate, as specified by the manufacturer, and will have no leaks in the system.

Performance Guide:

1. Check the kit for the air conditioning system and for all the parts needed for the proper installation.
2. Install the compressor, condenser, drier, thermostatic expansion valve, evaporator assembly, switches, hoses and electrical wiring.
3. Check all components for looseness, engine clearance and the proper positioning.
4. Charge the system with refrigerant, according to the manufacturer's specifications.
5. Perform the operational test for proper functioning.
6. Have the instructor check your installation.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Diagnose malfunctions in air conditioning.

Performance Objectives:

Given a vehicle with problems in the air conditioning unit, the necessary tools, equipment and the service manual, the student will identify the malfunctions in the air conditioning unit.

Evaluation Criterion:

The student will identify the malfunctions in the air conditioning unit and report to the instructor.

Performance Guide:

1. Perform a visual inspection, according to the manufacturer's service manual.
   a. Look for oil leaks around the compressor.
   b. Check the hoses for cuts and fittings for leaks.
   c. Make sure the control unit is in proper working order.
2. Install the manifold gauge set on the air conditioning unit to determine the pressure readings.
3. Check the sight glass for the ample refrigerant charge.
4. Check the electrical system with volt ohmmeter: Use the proper troubleshooting technique procedures.
5. Report the findings to the instructor.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Evacuate air conditioning system.

Performance Objectives:

Given a vehicle with an air conditioner, the necessary tools, equipment and a service manual, the student will evacuate the air conditioning system, according to the manufacturer's specifications.

Evaluation Criterion:

The student will evacuate the air conditioning system in the vehicle to the satisfaction of the instructor.

When completed, there will be no coolant remaining in the system.

Performance Guide:

1. Check the service manual for the outline of the air conditioning system's evacuation procedures.
2. Close the manifold gauge; set the hand valve.
3. Put on safety goggles, as recommended for handling chemicals.
4. Remove the service valve caps and install the appropriate manifold gauge set.
5. Position the hand-operated type service valves to the mid (cracked) position.
6. Purge the system of all the refrigerant by opening the low side manifold valve to the center hose, if the gauges indicate pressure.
7. Connect a vacuum pump to the center hose and allow it to work a minimum of a half hour (30 minutes).
8. Close the manifold hand valves; turn off and disconnect the vacuum pump; and observe the low side gauge for leaks.
9. Have the instructor check your air conditioning system evacuation.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Inspect and recharge system with refrigerant.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will charge an evacuated air conditioning system with refrigerant, according to the manufacturer's specifications.

Evaluation Criterion:

The student will charge the evacuated air conditioning system with refrigerant, to the satisfaction of the instructor.

Performance Guide:

1. Check the manufacturer's service manual for the correct amount of refrigerant required.
2. Install the manifold gauge set on the air conditioning unit and to the refrigerant supply.
3. Purge all the air from the service lines.
4. Charge until all the air is out from the service lines.
5. Check the sight glass for a clear flow (no trace of air).
6. Test-run the air conditioning unit.
7. Have the instructor check your procedures and whether you followed all safety practices in recharging the system.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Pressure-test system.

Performance Objectives:

Given a vehicle with an air conditioning unit, the necessary tools, equipment and a service manual, the student will install a manifold gauge set on the unit and compare the pressure readings, to the manufacturer's specifications.

Evaluation Criterion:

The student will pressure-test the air conditioner and report the findings to the instructor's approval.

Performance Guide:

1. Check the service manual for the pressure specifications.
2. Connect the manifold gauge set.
3. Purge the air from the service lines, and position the service valves (to the cracked position).
4. Run the engine at fast idle with the air conditioner on at least 5 minutes to allow the unit to stabilize.
5. Record the pressure readings and the ambient temperatures.
6. Compare readings to the specifications to determine if the unit is functioning properly.
7. Have the instructor check your test.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Leak-test system.

Performance Objectives:

Given a leak detector, the necessary tools, equipment and a service manual, the student will test for the refrigerant leaks on an assigned air conditioning unit, according to the manufacturer's specifications.

Evaluation Criterion:

The student will leak test the air conditioning unit on the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Run the engine at fast idle.
2. Operate the air conditioning unit, allowing enough time for the unit to stabilize.
3. Check the sight glass to make sure there is ample charge for testing.
4. Allow the air conditioning unit to operate on the high blower for about 10 minutes with windows or doors open.
5. Shut off the air conditioning unit and engine, and allow time for the pressure to equalize.
6. Using the leak detector, check all the components of the system for refrigerant leaks.
7. Have the instructor check your test procedures.

DUTY: AUTOMOBILE AIR CONDITIONERS

Repair air conditioning compressor.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will complete the necessary repairs on the given air conditioning compressor, according to the manufacturer's specifications.

Evaluation Criterion:

The student will locate the cause of the malfunction and make the necessary repairs to correct the problems in the air conditioning compressor, to the satisfaction of the instructor.

Performance Guide:

1. Check the service manual for the compressor overhaul procedures and specifications.
2. Disassemble and inspect all the compressor parts to locate the malfunction.
3. Replace the parts as needed and assemble, following the service procedures.
4. Leak-test the compressor with the appropriate adapter.
5. Have the instructor check your repair.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Replace air conditioning compressor.

Performance Objectives:

Given the necessary tools, equipment, and a service manual, the student will replace the air conditioning compressor on a given vehicle, according to the manufacturer's procedures.

Evaluation Criterion:

Replace the air conditioning compressor on the vehicle, to the satisfaction of the instructor.

Performance Guide:

1. Replace the compressor, according to the procedures specified in the service manual.
2. Evacuate the system.
3. Recharge the system.
4. Test-run the air conditioning unit.
5. Have the instructor check your work.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Repair electrical circuits.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will repair the electrical circuit in the automobile air conditioning system, according to the manufacturer's specfications.

Evaluation Criterion:

The student will locate the problem and repair the circuit, to the satisfaction of the instructor.

Performance Guide:

1. Check the operation of the air conditioning system.
2. Check the following:
   a. blown fuses.
   b. disconnected or broken wire (positive lead).
   c. disconnected or broken ground wire.
3. Check if the compressor clutch engages by checking the following:
   a. clutch coil.
   b. switch contacts.
   c. blower motor for defects.
4. Identify the problem and repair or replace the defective part(s).
5. Have the instructor check your work.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Repair vacuum circuits.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will repair the air conditioning vacuum circuit, according to the manufacturer's specifications.

Evaluation Criterion:

The student will locate the problem and repair or replace the defective components in the air conditioning vacuum circuit, to the satisfaction of the instructor.

Performance Guide:

1. Put the air conditioning system into operation.
2. Check the hoses and fittings for leaks.
3. Check the evaporator for proper operation and leaks.
4. Check the expansion valve for defects.
5. Identify the defects and repair or replace the components, as necessary.
6. Test the unit for proper operation and check for leaks.
7. Have the instructor check your work.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Replace condenser in air conditioning unit.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will replace the air conditioning condenser on the assigned vehicle, meeting the manufacturer's specifications.

Evaluation Criterion:

The student will replace the condenser in the air conditioning unit.

Performance Guide:

1. Install the manifold gauge set.
2. Release the refrigerant charge slowly.
3. Remove the receiver drier if attached.
4. Remove the condenser bolts and condenser from the vehicle.
5. Reverse steps 1-4 for installation.
6. Have the instructor check your work.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Replace compressor seals.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will replace the air conditioning compressor shaft seal and O-rings on the assigned compressor, according to the manufacturer's specifications.

Evaluation Criterion:

The student will install the compressor shaft seal and O-rings to the satisfaction of the instructor.

Performance Guide:

1. Install the manifold gauge set.
2. Release the refrigerant charge slowly.
3. Remove the following, according to the manufacturer's recommended procedures:
   a. clutch lock nut.
   b. clutch driven plate.
   c. seal seat retainer ring.
   d. seal seat.
   e. shaft seal.
   f. O-ring.
4. After checking that the compressor neck is thoroughly clean and all components are lubricated in refrigerant oil, install them reversing steps 1-3.
5. Have the instructor check your work.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Replace air conditioner fan motor.

Performance Objectives:

Given the necessary tools, equipment and the service manual, the student will replace the air conditioning fan motor in the assigned vehicle, according to the manufacturer's service manual.

Evaluation Criterion:

The student will replace the air conditioning fan motor in the given vehicle, to the satisfaction of the instructor.

When completed, the fan motor will operate properly at all speeds and have no rattles.

Performance Guide:

1. Disconnect the bolting ground cable.
2. Disconnect the blower motor wires.
3. Remove the four attaching screws.
4. Remove the blower motor and fan assembly.
5. Remove the fan.
6. Replace the motor.
7. Reinstall, reversing steps 1-6.
8. Have the instructor check your work.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Replace evaporator in air conditioning unit.

Performance Objectives:

Given the necessary tools, equipment, and a service manual, the student will replace the air conditioning evaporator on the assigned vehicle, meeting the manufacturer's specifications.

Evaluation Criterion:

The student will replace the air conditioning evaporator in the vehicle to the satisfaction of the instructor.

Performance Guide:

1. Install the manifold gauge set.
2. Release the refrigerant charge slowly.
3. Remove the refrigerant lines and front half of the refrigerant manifold.
4. Remove the manifold mounting studs and remove the evaporator assembly.
5. With the evaporator assembly removed, disassemble the evaporator case and remove the evaporator core.
6. Replace the evaporator core; reassemble and install the evaporator assembly.
7. Check for leaks and proper operation.
8. Have the instructor check your work.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Replace drier in air conditioning unit.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will replace the air conditioning receiver drier on the assigned vehicle, according to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the air conditioning receiver drier on the vehicle, to the satisfaction of the instructor.

Performance Guide:

1. Install the manifold gauge set.
2. Release the refrigerant charge slowly.
3. Disconnect the POA valve from the suction tube.
4. Disconnect the high and low pressure coolant lines.
5. Move the condenser for access to the drier.
6. Remove the drier and plug lines.
7. Replace the drier.
8. Reconnect the system reversing steps 3-5.
9. Test-run to check for leaks and proper operation.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Replace expansion valve in air conditioning units.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will replace the expansion valve on the air conditioning unit, according to the manufacturer's recommended procedures.

Evaluation Criterion:

The student will replace the expansion valve in the air conditioning unit, to the satisfaction of the instructor.

Performance Guide:

1. Install the manifold gauge set.
2. Release the refrigerant charge slowly.
3. Disconnect the equalizer line and expansion valve.
4. Pull out the sensing tube carefully from the suction line well.
5. Remove the rubber seal from the sensing tube.
6. Replace the expansion valve and reassemble reversing steps 1-5.
7. Test-run to check for leaks and proper operation.

DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Replace evaporator control valve or diaphragm in air conditioning unit.

Performance Objectives:

Given the necessary tools, equipment and a service manual, the student will replace the evaporator control valve, to the manufacturer's specifications.

Evaluation Criterion:

The student will replace the evaporator control valve in the air conditioning unit, to the satisfaction of the instructor.

Performance Guide:

1. Install the manifold gauge set.
2. Release the refrigerant charge slowly.
3. Remove the evaporator pressure regulator.
4. Repair or replace the malfunctioning diaphragm or unit itself.
5. Reinstall the evaporator pressure regulator.
6. Recharge the system with refrigerant.
7. Test-run to check for leaks and proper operation.
8. Have the instructor check your work.

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DUTY: AUTOMOBILE AIR CONDITIONERS

TASK: Repair automatic air conditioning and heater systems.

Performance Objectives:

Given a vehicle with faulty air conditioning and heating system, the necessary tools, equipment and a service manual, the student will locate and repair all the malfunctions, according to the manufacturer's specifications.

Evaluation Criterion:

The student will locate and make the necessary repairs to correct the malfunctions in the air conditioning and heating units, to the satisfaction of the instructor.

Performance Guide:

1. Performance-test the A.T.C. unit, following the recommended procedures.
2. Identify the area of malfunction: e.g., electrical, vacuum or refrigerant.
3. Repair or replace the defective component(s).
4. Evacuate and recharge the system, if necessary.
5. Test the A.T.C. unit.
6. Have the instructor check your work.

Introduction and Outline:

English
Spanish
Laotian

CE029790

INTRODUCTION TO AUTOMOTIVE MECHANICS

(MECHANICS HELPER)
AND
(SERVICE MECHANIC)

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COMPETENCY-BASED VOCATIONAL/TECHNICAL CURRICULUM SERIES

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The preparation of this multicultural series was aided financially through funding agreements with the Illinois State Board of Education/Department of Adult, Vocational and Technical Education.

(Contract Numbers: R-33-10-C-0442-400, R-33-21-J-0542-400)

June 1981

ARDEN L. PRATT, DEAN
E. HOLLIS MERRITT, ASST. DEAN
LARRY HEPBURN, CENTER DIRECTOR

INTRODUCTION

The Automotive Mechanics Program runs 36 weeks covering the repair-work areas of engine (4 weeks); drive trains - rear ends/drive shafts/manual transmission (4 weeks); carburetor (3 weeks); emission (3 weeks); ignition/tune-up (3 weeks); charging and starting (4 weeks); alignment (4 weeks); automatic transmission (4 weeks); brakes (4 weeks); and air conditioning and heating (3 weeks).

The class meets two hours each day in a related education class (a basic education program to improve the student's reading/English/mathematics skills necessary for vocational training and adequate performance at the entry level of employment) or in a GED class (to prepare for the General Education Development Test - a high school equivalency certification test), and six hours each day 5 days a week in the shop.

The student in the Automotive Mechanics Program will acquire the knowledge and skills required of a mechanics helper in all the repair areas. The student also will receive the additional training necessary to perform as a service mechanic with an option to concentrate in one or two repair areas and/or to perform as an automobile journeyman mechanic depending on his or her aptitude, interest and progress in class.

At the end of the training period, the student will be ready for job entry at the apprentice level.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Mechanics Helper*)

I. ENGINE OVERHAUL

1. Remove engine from vehicle.
2. Steam clean engine.
3. Remove and replace oil pans.
4. Clean engine parts and check for condition.
5. Replace exhaust manifold(s).
6. Inspect exhaust system.
7. Replace muffler.
8. Replace tailpipe assemblies.

II. DRIVE TRAINS

1. Inspect drive shaft, U-joints, and center bearings.
2. Lubricate or replace speedometer cable and housing.
3. Remove and replace speedometer cable and housing.
4. Lubricate universal joints.
5. Replace manual transmission.
6. Replace manual transmission rear seal, gasket and bushing.
7. Replace transmission mounts.

III. AUTOMATIC TRANSMISSIONS

1. Clean and inspect transmission visually.
2. Replace external seals, gaskets, and lines on automatic transmissions.
3. Service filter.

IV. ELECTRICAL SYSTEMS

1. Clean, gap and test spark plugs.
2. Inspect the light systems.
3. Service or replace batteries, cables and battery box.

V. CARBURETOR AND EMISSION

1. Clean carburetor.
2. Replace fuel filter.
3. Clean fuel filter.
4. Inspect, service, or replace carburetor air cleaner.
5. Install carburetor.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Mechanics Helper*)

VI. STANDARD AND POWER STEERING

1. Check manual steering gear fluid level.
2. Replace belts and adjust tension.

VII. BRAKING SYSTEMS

1. Bleed hydraulic brakes.
2. Replace brake hoses and lines; replace hydraulic lines and fittings.

VIII. FRONT ENDS

1. Adjust and repack front wheel bearings.
2. Lubricate ball joints.
3. Lubricate the front and rear suspension.
4. Replace shock absorbers and mounting.

IX. COOLING SYSTEMS

1. Check coolant freezing point.
2. Inspect, adjust, or replace fan belts.
3. Remove and replace radiators.
4. Replace core plugs (freeze plugs).
5. Replace heater hoses.
6. Replace radiator hoses.
7. Replace variable-speed fan.
8. Replace water pump.

X. HEATERS

1. Replace defroster hose.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Service Mechanic)

I. ENGINE OVERHAUL

1. Perform cylinder compression test.
2. Perform cylinder balance test.
3. Perform cylinder leakage test.
4. Disassemble engine.
5. Replace crankshaft and main bearings: inspect and correct the bearing fit; inspect the crankshaft and the connecting rod assembly.
6. Replace connecting rods and bearings.
7. Fit piston pins.
8. Grind valves.
9. Replace valves, valve guides and valve seals; resurface valve seats; service rocker arm assembly.
10. Inspect head for warp.
11. Diagnose valve train and head malfunctions.
12. Remove and replace oil pump.
13. Replace camshaft, camshaft bearings, timing gears, chains, gaskets, seals, and valve lifters.
14. Replace flywheel and flywheel ring gear.
15. Replace engine mounts.
16. Replace pistons, piston rings, gaskets and seals.
17. Adjust valves.
18. Perform operational inspections of positive engine lubrication systems.
19. Perform operational inspections of the positive crankcase ventilation system.

II. DRIVE TRAINS

1. Adjust external shift linkage on manual transmission.
2. Adjust clutch.
3. Rebuild overdrive unit.
4. Rebuild manual transmission.
5. Analyze and repair electrical control circuit and components for overdrive unit.
6. Diagnose differential malfunctions.
7. Repair hydraulic-type clutch.
8. Repair or replace differential.
9. Replace universal joints.
10. Replace front drive axle assemblies.
11. Repair and adjust front drive axle assemblies.
12. Replace mechanical-type clutch.
13. Replace pinion seal.
14. Replace pilot bearing.
15. Replace rear axle shaft, bearing and seal.
16. Replace speedometer drive gear.

II. DRIVE TRAINS (cont.)

17. Test manual transmission operation.
18. Replace clutch release bearings (throw-out bearings).

III. AUTOMATIC TRANSMISSION

1. Adjust floor linkage.
2. Adjust column-type linkage.
3. Adjust linkage from engine to automatic transmission.
4. Diagnose and adjust modulators.
5. Replace and adjust modulators.
6. Inspect and repair transmission cooling systems.
7. Inspect, remove and replace convertor.
8. Inspect and replace front pump, seal, and bushings.
9. Install automatic transmission cooler (external type).
10. Make band adjustments (internal or external).
11. Overhaul automatic transmission.
12. Perform operational tests on automatic transmission.
13. Remove and install automatic transmissions.
14. Adjust neutral safety switch.
15. Replace and adjust neutral safety switch.

IV. ELECTRICAL SYSTEMS

1. Analyze or adjust engine performance using engine analyzer.
2. Analyze cause of electrical fires.
3. Analyze malfunctions in the cranking system.
4. Inspect secondary circuit lead wires, distributor cap, and rotor. Measure resistance in secondary wires.
5. Inspect ignition switch, resistor, wiring, and coil of the primary circuit.
6. Replace coil of the primary circuit.
7. Repair or replace switches.
8. Replace ignition switch and resistor.
9. Set ignition timing.
10. Inspect points and condenser of the primary circuit.
11. Replace points and condenser.
12. Evaluate alternator/generator output.
13. Repair or replace charging system regulators.
14. Repair generators or alternators.
15. Replace generators and alternators.
16. Replace and adjust distributors.
17. Strobe distributor, and modify or correct advance curves.
18. Replace chassis and underhood wiring.
19. Replace solenoids.
20. Repair starters.

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IV. ELECTRICAL SYSTEMS (cont.)

21. Replace starters.
22. Repair or replace fuse box assembly.
23. Repair or replace lighting system components.
24. Replace flasher units.
25. Test and repair cruise control units.
26. Test and rewire dash units.
27. Inspect and test windshield wiper motors, blades, and arms.
28. Repair windshield wiper mechanisms and controls.
29. Test and repair transistor ignition systems.

V. CARBURETOR AND EMISSION

1. Learn about pollution control. (Theory only)
2. Learn P.C.V. crankcase emission control systems. (Theory only)
3. Know the basic P.C.V. engine modification. (Theory only)
4. Identify exhaust emission control systems. (Theory only)
5. Identify evaporative emission control systems. (Theory only)
6. Adjust infra-red machine.
7. Test for hydro carbon and carbon monoxide level.
8. Adjust carburetor.
9. Repair or service carburetors.
10. Analyze for moisture or foreign particle level in fuel system.
11. Adjust choke unit, (Automatic and manual).
12. Inspect, clean and adjust choke unit (automatic and manual).
13. Replace gas tank sending unit.
14. Measure fuel flow and pressure.
15. Perform operational inspections of exhaust emission control system.
16. Perform operational inspections of evaporative emission control system.
17. Service or repair manifold heat and controls.
18. Remove and replace fuel pump.
19. Repair or replace fuel lines and hoses.

VI. STANDARD AND POWER STEERING

1. Adjust worm and sector in steering gear.
2. Replace steering spindles.
3. Inspect steering gear.
4. Inspect steering linkage.
5. Lubricate steering gear and linkage.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Service Mechanic)

VI. STANDARD AND POWER STEERING (cont.)

6. Adjust power steering units. Check power steering fluid level.
7. Rebuild power steering units.
8. Repair power steering pumps.
9. Replace power steering pumps.
10. Replace manual steering linkage components.
11. Replace manual steering gear components.
12. Replace power steering components.
13. Replace filter in power steering.

VII. BRAKING SYSTEMS

1. Arc grind brake shoes.
2. Adjust parking brake linkage.
3. Adjust hand brake external band.
4. Replace hand brake external band.
5. Free-up parking brake cables.
6. Inspect and replace brake pads (disc brakes).
7. Inspect and turn rotor (disc brakes).
8. Inspect and refinish brake drums.
9. Inspect and replace self-adjusters.
10. Perform operational brake inspection.
11. Recondition backing plates.
12. Repair disc brake calipers.
13. Repair master cylinder.
14. Replace master cylinder.
15. Rebuild brake power units.
16. Repair self-adjuster.
17. Repair wheel cylinder.
18. Replace wheel cylinder.
19. Replace brake shoes.
20. Replace hydraulic control valves.
21. Replace hydraulic brake power units.
22. Replace hydraulic power cylinder.
23. Replace parking brake linkage.

VIII. FRONT ENDS

1. Adjust torsion bars.
2. Replace torsion bars.
3. Adjust front wheel bearing. Inspect wheel bearings.
4. Balance wheels and tires.
5. Check and align front end.
6. Inspect and replace steering damper.
7. Perform visual inspections of the suspension systems.
8. Inspect and repair front suspension systems.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Service Mechanic)

VIII. FRONT ENDS (cont.)

9. Rebush king pins or link pins.
10. Repair rear suspension systems.
11. Replace ball joints.
12. Replace front wheel bearing grease seal.
13. Replace front suspension control arms and bushings.
14. Replace rear suspension systems.

IX. COOLING SYSTEMS

1. Check coolant temperature.
2. Check overflow tank.
3. Chemically clean and flush cooling system.
4. Perform chemical test on cooling systems.
5. Pressure-test cooling system.
6. Solder minor leaks in radiators.
7. Test thermostat.
8. Replace thermostat.

X. HEATERS

1. Diagnose heating system malfunctions.
2. Replace heater control units.
3. Remove and replace heater core.
4. Repair heater core.
5. Service heater control components.

XI. AUTOMOBILE AIR CONDITIONERS

1. Install air conditioners in vehicles.
2. Diagnose malfunctions in air conditioning.
3. Evacuate air conditioning system.
4. Inspect and recharge system with refrigerant.
5. Pressure-test system.
6. Leak-test system.
7. Repair air conditioning compressor.
8. Replace air conditioning compressor.
9. Repair electrical circuits.
10. Repair vacuum circuits.
11. Replace condenser in air conditioning unit.
12. Replace compressor seals.
13. Replace air conditioner fan motor.
14. Replace evaporator in air conditioning unit.
15. Replace drier in air conditioning unit.
16. Replace expansion valve in air conditioning units.

XI. AUTOMOBILE AIR CONDITIONERS (cont.)

17. Replace evaporator control valve or diaphragm in air conditioning unit.
18. Service air conditioner control cables.
19. Repair automatic air conditioning and heater systems.

INTRODUCTION TO AUTOMOTIVE MECHANICS

SPANISH VERSION

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INTRODUCTION TO AUTOMOTIVE MECHANICS

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MASAKO T. SHIN, CURRICULUM SPECIALIST, STC, SIU-C

TRANSLATED BY

DR. ALBERT W. BORK, EMERITUS, SIU-C

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June 1981

ARDEN L. PRATT, DEAN
E. HOLLIS MERRITT, ASST. DEAN
LARRY HEPBURN, CENTER DIRECTOR

INTRODUCCIÓN

El program de entrenamiento en la mecánica automotriz es de 36 semanas e incluye lo siguiente: reparación de motor - 4 semanas; los árboles de transmisión/ los diferenciales/cajas de cambio manuales - 4 semanas; carburadores y la carburación - 3 semanas; control de emisiones - 3 semanas; encendido/afinación - 3 semanas; cargamento de acumuladores/marchas - 4 semanas; alineamiento - 4 semanas; cajas de cambio automáticas - 4 semanas; frenos - 4 semanas; acondicionadores de aire y calefacción - 3 semanas.

La clase se reúne 2 horas al día y va incluida en el programa de educación afín (un programa de educación básica para mejorar al alumno en la lectura/inglés/matemática necesarias para el entrenamiento vocacional y la realización adecuada de las tareas del oficio en el primer empleo) Alternativamente la instrucción en la técnica automotriz se incluye en la clase de Desenvolvimiento General Educativo (GED) para obtener el certificado de equivalencia en la educación secundaria. Además de las dos horas ya mencionadas hay 6 horas diarias en el taller durante 5 días de la semana.

El alumno en el programa de reparaciones automotrices obtendrá los conocimientos y la destreza en todos los aspectos del trabajo adecuados para que sirva de mecánico-ayudante y además el entrenamiento necesario para que sirva de mecánico de servicios con la opción de concentrarse en una o dos actividades del ramo, y/o lo necesario para poder trabajar como maestro-mecánico automotriz, según sus aptitudes individuales, su aplicación, y su progreso en las clases del programa de entrenamiento.

Al terminar el período de entrenamiento el alumno podrá entrar cuando menos al nivel de oficial en la mecánica automotriz.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX

LA MECANICA AUTOMOTRIZ: RELACION DE DEBERES Y TRABAJO
(Mecánico ayudante u oficial en mecánica automotriz)

I. REPASO GENERAL DE MOTORES

1. Sacar el motor del vehículo.
2. Limpiar a vapor el motor.
3. Quitar y reponer los cárteres (depósitos de aceite).
4. Desarmar el motor. Limpiar las piezas del motor y revisar su estado de desgaste.
5. Reponer el colector (los colectores) de escape.
6. Revisar el sistema de escape.
7. Reponer el mofle.
8. Reponer el conjunto de tubería de escape.

II. LOS ÁRBOLES DE TRANSMISIÓN

1. Revisar el árbol de transmision, los cardanes (U-joints) y los cojinetes centrales.
2. Engrasar y reponer el cable y la cubierta del velocímetro.
3. Engrasar los cardanes.
4. Reponer la transmisión manual.
5. Reponer el sello trasero, junta y cojinete de la transmisión manual.
6. Reponer las montaduras de la transmisión.

III. TRANSMISIONES AUTOMÁTICAS

1. Limpiar y revisar visualmente la transmisión.
2. Reponer sellos externos, juntas, y líneas de tubería de transmisión automática.
3. Dar servicio necesario al filtro, o cambiarlo.

IV. SISTEMAS ELÉCTRICOS

1. Limpiar, calibrar, y probar las bujías.
2. Revisar el sistema de faros, luces de carretera, de cruce y de posición, y los indicadores de cambio de dirección.
3. Dar servicio al acumulador (la batería), o reponerlo, con sus cables y su soporte o cajón.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX

LA MECANICA AUTOMOTRIZ: RELACION DE DEBERES Y TRABAJO
(Mecánico ayudante u oficial en mecánica automotriz)

V. EL CARBURADOR Y LAS EMISIONES

1. Limpiar carburador.
2. Reponer el filtro de combustible.
3. Limpiar el filtro de combustible.
4. Revisar, dar servicio, o reponer el limpiador de aire del carburador.
5. Montar el carburador.

VI. DIRECCIÓN MANUAL

1. Checar nivel de líquido en el engranaje de la dirección manual.

DIRECCIÓN ACCIONADA MECÁNICAMENTE

1. Reponer correas y ajustar tensión.

VII. SISTEMAS DE FRENOS

1. Sangrar los frenos hidráulicos.
2. Reponer las mangueras y tubería, y la tubería hidráulica y los herrajes accesorios.

VIII. LAS RUEDAS DELANTERAS Y EL MECANISMO DE ELLAS

1. Ajustar y reponer la grasa de los cojinetes de las ruedas delanteras.
2. Engrasar las articulaciones esféricas.
3. Engrasar los brazos de suspensión y checar el nivel de la grasa en los elementos traseros.
4. Reponer los amortugadores y su montadura.

IX. SISTEMAS REFRIGERANTES

1. Checar el refrigerante para averiguar el punto de congelación.
2. Revisar, ajustar, o reponer las correas del ventilador.
3. Desmontar y reponer (remontar) el radiador.
4. Reponer los tapones anticongeladores.
5. Reponer las mangueras del calentador.
6. Reponer las mangueras del radiador.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX

LA MECANICA AUTOMOTRIZ: RELACION DE DEBERES Y TRABAJO
(Mecánico ayudante u oficial en mecánica automotriz)

IX. SISTEMAS REFRIGERANTES (Continuación)

7. Reponer el ventilador de velocidades variables.
8. Reponer la bomba del agua refrigerante.

X. CALENTADORES

1. Reponer la manguera del desescarchador.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX

LA MECANICA AUTOMOTRIZ: RELACION DE LOS DEBERES Y TAREAS (Mecánico de Servicio)

I. REVISIÓN GENERAL DE LOS MOTORES

1. Checar compresión de los cilindros.
2. Probar equilibrio de los cilindros.
3. Checar fugas en los cilindros.
4. Desmontar y desarmar motor.
5. Reponer el cigüeñal y cojinetes principales: checar y corregir ajuste de los cojinetes; revisar el cigüeñal y ensamble de bielas.
6. Reponer bielas y cojinetes.
7. Instalar y ajustar muñones de las bielas.
8. Esmerilar válvulas.
9. Reponer válvulas, guías y juntas herméticas; tornear los asientos de las válvulas; revisar y ajustar balancín empujaválvulas.
10. Revisar cabezas de válvulas para hallar torceduras.
11. Diagnosticar malfuncionamiento de tren de válvulas y de culata.
12. Desmontar y reponer bomba de aceite.
13. Reponer arbol (eje) de levas, cojinetes, engranaje de la distribución de tiempos del encendido, cadenas, juntas, sellos obturadores, y levanta-válvulas.
14. Reponer volante y su engranaje anular.
15. Reponer montaduras del motor.
16. Reponer pistones, anillos, juntas y sellos obturadores.
17. Ajustar válvulas.
18. Llevar a cabo revisiones (inspecciones) operacionales de los sistemas positivos de lubricacion del motor.
19. Llevar a cabo inspecciones operacionales del sistema positivo de ventilación (respiración) del carter.

II. ÁRBOLES DE IMPULSO (PROPULSIÓN)

1. Ajustar la articulación externa de la transmisión manual.
2. Ajustar el embrague.
3. Reconstruir la super marcha (la velocidad sobremultiplicada)
4. Reconstruir transmisión manual.
5. Analizar y reparar circuito eléctrico de control y la partes componentes de la super marcha.
6. Diagnosticar malfuncionamientos en el diferencial.
7. Componer un embrague hidráulico.
8. Reponer o componer un diferencial.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX

LA MECANICA AUTOMOTRIZ: RELACION DE LOS DEBERES Y TAREAS
(Mecánico de Servicio)

II. ÁRBOLES DE IMPULSO (PROPULSIÓN) (Continuación)

9. Reponer juntas cardánicas (cardanes).
10. Reponer ensamble de un eje de marcha delantera.
11. Reparar y ajustar el ensamble de un eje de maraha delantera.
12. Reponer un embrague mecánico.
13. Reponer sello obturador del engranaje piñón.
14. Reponer de cojinete guía.
15. Reponer flecha del eje trasero, cojinete y sello obturador.
16. Reponer el engranaje impulsor del velocímetro.
17. Reponer los cojinetes del soltador del embrague.
18. Reponer engranajes de desembrague.

III. CAJA DE CAMBIOS AUTOMÁTICA

1. Ajustar articulación de piso.
2. Ajustar articulación en la columna de dirección.
3. Ajustar articulación desde el motor a la caja de cambios automática.
4. Diagnosticar malfuncionamiento y ajustar moduladores.
5. Reponer moduladores.
6. Revisar y componer sistema de enfriamiento de la caja de cambios automática.
7. Revisar, desmontar y reponer convertidor.
8. Revisar y reponer bomba delantera, sello obturador y cojinetes.
9. Instalar aparato enfriador de la caja de cambios (tipo externo).
10. Ajustar zunchos (externos e internos).
11. Hacer reparaciones generales de la caja de cambios automática.
12. Llevar a cabo pruebas operacionales de la caja de cambios automática.
13. Desmontar y montar cajas de cambio automáticas.
14. Ajustar el interruptor de seguridad del punto neutral de la caja de cambios automática.
15. Desmontar y reponer el interruptor de seguridad.

IV. SISTEMAS ELÉCTRICOS

1. Analizar y ajustar funcionamiento del motor empleando el aparato analizador.

IV. SISTEMAS ELÉCTRICOS (Continuación)

2. Analizar causas de los incendios eléctricos.
3. Analizar malfuncionamiento en el sistema de la marcha.
4. Revisar hilos principales del circuito secundario, la tapa del distribuidor, y su rotor.
5. Revisar el interruptor del encendidor, resistor, alambrado, y bobina del circuito primario.
6. Reponer la bobina del circuito primario.
7. Reparar o reponer interruptores.
8. Reponer el interruptor y el resistor del encendido.
9. Ajustar los tiempos del encendido.
10. Revisar los platinos y el condensador del circuito primario.
11. Reponer platinos y el condensador.
12. Evaluar la energía suministrada por el dinamo/alternador.
13. Reparar o reponer reguladores del sistema de carga.
14. Reparar dinamos o alternadores.
15. Reponer (montar) dinamos o alternadores.
16. Reponer y ajustar distribuidores.
17. Checar el distribuidor con el estroboscopio y modificar y corregir curvas de avance.
18. Reponer alambrado de chasis y capó.
19. Reponer solenoides.
20. Reparar marchas.
21. Reponer (montar) marchas.
22. Reparar o reponer ensamble de la caja de fusibles.
23. Reparar o reponer elementos del sistema de alumbrado.
24. Reponer unidades destellantes.
25. Probar y componer unidades de control de velocidad en la carretera.
26. Probar y reponer alambrado de los instrumentos del tablero.
27. Revisar y probar los motores de los limpiaparabrisas, las aletas, y ensamble.
28. Componer los mecanismos de los limpiaparabrisas y los controles correspondientes.
29. Probar y componer sistemas de encendido controlado por transistor.

V. CARBURADOR Y EMISIONES

1. Aprender control de contaminación del aire. (Teoría solamente).
2. Aprender sistemas de control de emisiones del cárter mediante la válvula positiva de control.

LA MECANICA AUTOMOTRIZ: RELACION DE LOS DEBERES Y TAREAS
(Mecánico de Servicio)

V. CARBURADOR Y EMISIONES (Continuación)

3. Saber la alteración (modificación) básica de motores mediante instalación de la válvula positiva de control.
4. Identificar sistemas de control de gases de escape. (Teoría Solamente)
5. Identificar sistemas de control de emisiones por evaporación. (Teoría Solamente)
6. Ajustar máquina infrarroja.
7. Probar niveles de hidrocarbones y el monóxido de carbono.
8. Ajustar carburación.
9. Reparar o cuidar los carburadores.
10. Analizar humedad y particulado extráneo en el sistema surtidor de combustible.
11. Ajustar la unidad de estrangulación (el estrangulador) tanto automático como manual.
12. Revisar, limpiar y ajustar la unidad de estrangulación, tanto automático como manual.
13. Reponer grupo indicador del depósito de gasolina.
14. Medir el suministro y presión de combustible al motor.
15. Llevar a cabo inspección operacional del sistema de control de emisiones (gases) del escape.
16. Llevar a cabo inspección operacional del sistema evaporativo de control de emisiones.
17. Ajustar y componer controles de calor de los colectores.
18. Desmontar y remontar (reponer) bomba de combustible.
19. Reparar y reponer líneas y mangueras del combustible.

VI. DIRECCION - NORMAL Y MECANOACCIONADA

1. Ajustar tornillo sinfin y sector de la dirección.
2. Reponer las manguetas de la dirección.
3. Revisar engranaje de la dirección.
4. Revisar articulación de la dirección.
5. Lubricar engranaje y articulación de la dirección.
6. Ajustar grupo de la dirección mecanoaccionada checar nivel de la dirección mecanoaccionada.
7. Reconstruir el grupo de la dirección mecanoaccionada.
8. Reparar bombas de dirección mecanoaccionada.
9. Reponer piezas (componentes) de la dirección manual.
10. Reponer piezas (componentes) de la dirección mecanoaccionada.
11. Reponer bombas de la dirección mecanoaccionada.
12. Reponer filtro de la dirección mecanoaccionada.

VII. SISTEMAS DE FRENADO

1. Esmerilar en arco las zapatas de freno.
2. Ajustar articulación del freno de estaccionamiento.
3. Ajustar abrazadera (zuncho) externa del freno manual.
4. Reponer abrazadera (zuncho) externa del freno.
5. Librar cables del freno manual.
6. Revisar y reponer zapatas de freno (de disco).
7. Revisar y voltear el rotor de frenos (de disco).
8. Revisar y rectificar tambores de frenos.
9. Revisar y reponer autoajustadores.
10. Llevar a cabo inspección operacional de los frenos.
11. Rectificar (reacondicionar) contraplacas (placas de respaldo).
12. Componer las horquillas de los frenos de disco.
13. Reparar cilindro maestro.
14. Reponer cilindro maestro.
15. Reconstruir elementos del sistema de frenos.
16. Reparar autoajustador.
17. Reparar cilindros de rueda.
18. Reponer cilindros de rueda.
19. Reponer zapatas.
20. Reponer válvulas hidráulicas de control.
21. Reponer unidades de potencia de los frenos hidráulicos.
22. Reponer cilindro de potencia hidráulico.
23. Reponer articulación del freno de estacionamiento (parqueamiento).

VIII. PARTE DELANTERA

1. Ajustar barras de torsión.
2. Reponer barras de torsión.
3. Ajustar cojinetes (baleros) de las ruedas delanteras. Checar cojinetes.
4. Poner ruedas y llantas en equilibrio.
5. Revisar (checar) y alinear mecanismo de la dirección y ruedas delanteras.
6. Revisar y reponer elemento moderador de la dirección.
7. Llevar a cabo inspección visual de los sistemas delanteros de suspensión.
8. Revisar y componer sistemas delanteros de suspensión de ruedas.
9. Reponer cojinetes de los pernos (reales).
10. Componer sistema posterior de suspensión.
11. Reponer articulación de rótula.
12. Reponer el retenedor de la grasa de las ruedas delanteras.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX

LA MECANICA AUTOMOTRIZ: RELACION DE LOS DEBERES Y TAREAS (Mecánico de Servicio)

VIII. PARTE DELANTERA (Continuación)

13. Reponer brazos de control y casquillos de las ruedas delanteras.
14. Reponer suspensión posterior.

IX. SISTEMAS DE ENFRIAMIENTO

1. Checar la temperatura del líquido refrigerante.
2. Checar tanque de rebosamiento.
3. Limpiar con química el sistema refrigerante y enjuagar completamente mediante buenas descargas de agua (rellenar y drenar completamente).
4. Llevar a cabo prueba química del sistema enfriador.
5. Probar sistema enfriador a presión.
6. Soldar fugas menores del radiador.
7. Probar termostato.
8. Reponer termostato.

X. CALENTADOR

1. Diagnosticar malfuncionamientos del sistema de calefacción.
2. Reponer unidad de control del calentador.
3. Sacar y reponer haz tubular del calentador.
4. Reparar haz tubular del calentador.
5. Revisar y arreglar en forma debida los elementos de control del calentador.

XI. ACONDICIONADORES DE AIRE PARA AUTOMOVILES

1. Instalar acondicionadores de aire en vehículos.
2. Diagnosticar malfuncionamientos de acondicionadores de aire.
3. Evacuar el sistema de aire accondicionado.
4. Revisar y cargar de nuevo el sistema con gas refrigerante.
5. Probar a presión el sistema.
6. Probar el sistema para encontrar fugas.
7. Reparar (Componer) el compresor del acondicionador de aire.
8. Reponer (Reemplazar) el compresor del acondicionador de aire.
9. Reparar vacuocircuitos (circuitos al vacío).

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX

LA MECANICA AUTOMOTRIZ: RELACION DE LOS DEBERES Y TAREAS (Mecánico de Servicio)

XI. ACONDICIONADORES DE AIRE PARA AUTOMOVILES (Continuación)

10. Reparar circuitos eléctricos.
11. Reponer condensador del aparato de aire acondicionado.
12. Reponer juntas hermeticas del compresor.
13. Reponer motor del ventilador.
14. Reponer el evaporador del aparato de aire acondicionado.
15. Reponer el secador del aparato de aire acondicionado.
16. Reponer la válvula de expansión en el.
17. Reponer la válvula de control de evaporación (del evaporador) o el diafragma en el aparato de aire acondicionado.
18. Poner en buen estado los cables del aparato de aire acondicionado.
19. Componer sistemas automáticos de acondicionamiento de aire y de calefacción.

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LARRY HEPBURN, CENTER DIRECTOR

ຄຳນຳ.

ຫຼັກສູດການແປງລົດ ຈະໃຊ້ເວລາ 36 ອາທິດ ຈະລວມການແປງເຄື່ອງຈັກ (4 ອາທິດ); ສ່ວນປະກອບທີ່ໃຊ້ໃນການຂັບເຄື່ອນ - ເພົາຂັບເຄື່ອນ - ຊ່ວງລໍ້ທາງໜ້າ. ແລະ ກະປຸກເກັ້ຍທັມມະດາ (4 ອາທິດ). ເຄື່ອງແສມນ້ຳມັນກັບອາກາດ (Caburetor) (3 ອາທິດ); ການຖ່າຍເທອາກາດຂອງເຄື່ອງຈັກ (Emission) (3 ອາທິດ); ການຈູດໄຟຂອງຈານຈ່າຍ ແລະ ການຕັ້ງເຄື່ອງ (Ignition / tune-up) (3 ອາທິດ); ການອັດໄຟ ແລະ ການຕິດເຄື່ອງ (4 ອາທິດ); ການຕັ້ງສູນຂອງລໍ້ (Alignment) (4 ອາທິດ); ກະປຸກເກັ້ຍແບບ Automatic (4 ອາທິດ); ເບຣກ (brakes) (4 ອາທິດ) ແລະ ເຄື່ອງເຮັດຄວາມຮ້ອນຄວາມເຢັນ (3 ອາທິດ).

ການເຂົ້າຮຽນກ່ຽວກັບວິຊາການສຶກສາທີ່ກ່ຽວຂ້ອງກັບວຽກງານ (Related Education) ຈະໃຊ້ເວລາສອງຊົ່ວໂມງຕໍ່ວັນ ເພື່ອທີ່ຈະປັບປຸງຫລັກຮຽນທາງດ້ານການອ່ານ, ຄວາມຮູ້ທາງພາສາອັງກິດ ແລະ ຄວາມສາມາດໃນການໄລ່ເລກຄະນິດທີ່ຈຳເປັນສຳລັບງານໃນອາຊີບ ແລະ ມີຄວາມສາມາດພຽງພໍທີ່ຈະເຂົ້າເຮັດວຽກນັ້ນຕໍ່ໄດ້ ນີ້ໃຊ້ເວລາ 2 ຊົ່ວໂມງນີ້ ເພື່ອ

ຕຽມຕົວສອບເສັງເອົາຊັ້ນມັດທະຍົມຕອນປາຍ (General Education Development test ຫຼື ການສອບ G.E.D.) ແລ້ວ 6 ຊົ່ວໂມງ ທີ່ເຫຼືອ ຈະເປັນການຝຶກພາກປະຕິບັດ ທຸກ ທຸກວັນ 5 ວັນຕໍ່ອາທິດ.

ນັກຮຽນທີ່ຢູ່ໃນຫຼັກສູດການແປງຣົດ ຈະໄດ້ຮັບຄວາມຮູ້ ແລະ ຄວາມຊຳນານໃນການແປງທຸກດ້ານທີ່ຕ້ອງການ ຜູ້ຊ່ວຍຊ່າງແປງ ແລະ ການຝຶກເພີ່ມເຕີມເທົ່າທີ່ຈຳເປັນ ທີ່ຈະເຂົ້າເຮັດວຽກເປັນ ນາຍຊ່າງແປງ (Service mechanic) ຫຼື ຈະເລືອກກົມໃດໃນນຶ່ງ ຫຼື ສອງດ້ານ ຫຼື ຈະເປັນ ນາຍຊ່າງຜູ້ຄຸມ ຂຶ້ນຢູ່ກັບ ຄວາມເໝາະສົມຂອງນັກຮຽນ, ຄວາມສົນໃຈ ແລະ ຄວາມກ້າວໜ້າໃນຊັ້ນ.

ຫຼັງຈາກການຝຶກຊ້ອມ, ນັກຮຽນຈະຕຽມຕົວ ລຽບລຽງ ເພື່ອຈະເຂົ້າເຮັດວຽກ ຂັ້ນຝຶກ ທາງແປງຣົດ.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Mechanics Helper*)

ສາລະບານ: ໜ້າທີ່ ແລະ ການງານຂອງການສ້ອມແປງລົດ.

(ຜູ້ຊ່ວຍຊ່າງສ້ອມແປງລົດ).

I. ENGINE OVERHAUL: ການຍົກເຄື່ອງ.

1. ຖອດເອົາເຄື່ອງຈັກອອກ.
2. ເອົານ້ຳຮ້ອນ ຂັດລ້າງເຄື່ອງ.
3. ຖອດຈານຮອງນ້ຳມັນເຄື່ອງ.
4. ລ້າງສ່ວນປະກອບຂອງເຄື່ອງຈັກ ແລະ ກວດເບິ່ງສະພາບ ຂອງສ່ວນປະກອບ.
5. ປ່ຽນທາງອອກຂອງທໍ່ອາຍເສັຽ.
6. ກວດຜະບັບທໍ່ອາຍເສັຽ.
7. ປ່ຽນທໍ່ເກັບສຽງ.
8. ປ່ຽນປາຍທໍ່ອາຍເສັຽ.

II. DRIVE TRAINS: ສ່ວນທີ່ຂັບເຄື່ອນຂອງລົດ.

1. ກວດເພົາລົດ U- Joints ແລະ ລູກປືນ ຫຼໍ່ລື່ນ ທາງທາງ.
2. ໃສ່ນ້ຳມັນຫຼໍ່ລື່ນ ແລະ ປ່ຽນສາຍໝຸນ ເຄື່ອງວັດຄວາມໄວ.
3. ຖອດອອກ ຫຼື ປ່ຽນສາຍໝຸນ ເຄື່ອງວັດຄວາມ[illegible]
4. ໃສ່ຈາລະບີ ບ່ອນ U- Joints
5. ປ່ຽນກະປຸກເກັຽ ທ້າຍຕາ.
6. ປ່ຽນຊັນກັນຮົວ, ໂບ່ເກຍ ແລະ ປອກຂອງກະປຸກເກັຽທ້າຍຕາ.
7. ປ່ຽນອັນຈັບກະປຸກເກັຽ.

III. AUTOMATIC TRANSMISSIONS: ເກັຽອໍໂຕມັດ.

1. ທໍາຄວາມສະອາດ ແລະກວດເບິ່ງກະປຸກເກັຽ.
2. ປ່ຽນອັນກັ້ນນໍ້າມັນຮົ່ວດ້ານນອກ, ໂປເກນ ແລະ ສາຍຕໍ່ບ່ອນກະປຸກເກັຽ.
3. ກວດເບິ່ງ ຣັ່ນທາງຂອງເກັຽ.

IV. ELECTRICAL SYSTEMS: ລະບົບໄຟຟ້າ.

1. ລ້າງ ແລະ ກັ້ງບ່ອນຕໍ່ຂອງຫົວຫຽນ ແລະ ທົດລອງໝໍ້ອັດ.
2. ກວດເບິ່ງ ລະບົບໄຟສ່ອງ.
3. ກວດເບິ່ງ ຫຼື ປ່ຽນ ໝໍ້ເກັບໄຟ, ສາຍແລ່ນໄຟ ແລະ ຫົບ ໃສ່ໝໍ້ໄຟ.

V. CARBURETOR AND EMISSION: ຄາບູເຣເຕີ້ ແລະເຄື່ອງລວບຄວນອາກາດ.

1. ລ້າງ Carburetor.
2. ປ່ຽນອັນກອງນໍ້າມັນ.
3. ລ້າງອັນກອງນໍ້າມັນ.
4. ກວດເບິ່ງ, ບໍລິການ ຫຼື ປ່ຽນ ທີ່ກອງລົມຂອງ Carburetor.
5. ຕິດຕັ້ງ Carburetor.

VI. STANDARD AND POWER STEERING: ພວງມາໄລ ຣົດ ມາຕຖານ ແລະ: ພວງມາໄລໄຊ້ກໍາລັງລົມ.

1. ກວດເບິ່ງບ່ອນໃສ່ນໍ້າມັນຂອງທາງກະປຸກເກັຽຂອງພວງມາໄລ.

2. ປຽນ ສາຍພານ ແລະ ຕັ້ງໃຫ້ເຄັ່ງ ຕາມກຳນົດ.

VII. BRAKING SYSTEMS: ລະບົບຫ້າມລໍ້ (ເບຣກ.)

1. ໄລ່ລົມອອກຈາກລະບົບ Hydraulic.
2. ປ່ຽນສາຍທໍ່ຂອງຫ້າມລໍ້ ; ປ່ຽນຂີ້ທໍ່ຂອງເຫຼັກ Hydraulic.

VIII. FRONT ENDS: ຊ່ວງໜ້າ.

1. ຕັ້ງແລະໃສ່ຈາຣະບີໃໝ່ໃນລູກປືນ ທີ່ລໍ້ນຂອງລໍ້.
2. ອັດຈາຣະບີ ບ່ອນ Ball Joints.
3. ອັດຈາຣະບີ ບ່ອນ Suspension ຂ້າງໜ້າ ແລະ ຫຼັງ.
4. ປ່ຽນ ຊອກອັບ ແລະ ອັນຈັບ.

IX. COOLING SYSTEMS: ລະບົບເຮັດໃຫ້ເຄື່ອງເຢັນ,

1. ກວດເບິ່ງຈຸດນ້ຳແຮງຂອງນ້ຳໃນໝໍ້ນ້ຳ.
2. ກວດເບິ່ງ, ຕັ້ງ ແລະ ປ່ຽນ ສາຍພານພັດລົມ.
3. ຊອດ ແລະ ປ່ຽນ ໝໍ້ນ້ຳ.
4. ປ່ຽນ Core plugs (Freeze plugs)
5. ປ່ຽນທໍ່ຢາງຂອງເຄື່ອງເຮັດຄວາມຮ້ອນໃນຣົດ.
6. ປ່ຽນທໍ່ຢາງຂອງໝໍ້ນ້ຳ.
7. ປ່ຽນພັດລົມ ທີ່ເປົ່າໃນຣົດ.
8. ປ່ຽນ ປັ້ມນ້ຳ.

X. HEATERS: ເຄື່ອງເຮັດຄວາມຮ້ອນ.

1. ປ່ຽນ ທໍ່ຢາງ ທີ່ລັບ ເຮັດໃຫ້ ນ້ຳ ແຫງ ຊະລາຍ.

AUTOMOTIVE MECHANICS: DUTY-TASK INDEX (Service Mechanic)

ສາລະບານ : ໜ້າທີ່ແລະການງານຂອງການສ້ອມແປງຣົດ (ບໍຣິການ).

I. ENGINE OVERHAUL: ການຍົກເຄື່ອງ.

1. ທົດລອງຄວາມກົດດັນຂອງລູກສູບ.
2. ທົດລອງການມີຄວາມກົດດັນເທົ່າທຽມກັນ.
3. ທົດລອງເບິ່ງການຮົ່ວຂອງລູກສູບ.
4. ຖອດສ່ວນປະກອບຂອງເຄື່ອງຈັກອອກ.
5. ປ່ຽນຂໍ້ຍຽງ (Crankshaft) ແລະ ລູກປືນ (Main bearing) ກວດເບິ່ງແລະ ແກ້ໄຂວ່າລູກປືນເຂົ້າກັບຂໍ້ຍຽງດີຫຼືບໍ່; ກວດເບິ່ງຂໍ້ຍຽງ ແລະ ກ້ານສູບ.
6. ປ່ຽນກ້ານສູບ ແລະ ລູກປືນ (Cam bearing)
7. ດີ້ Piston pin.
8. ບົດຫຼືຝົນລີ້ນສູບ (Valves).
9. ປ່ຽນ Valves, Valve quides ແລະ Valve seals; ດໍ-ດໍ Valve seat ລຽບ, ສ້ອມແປງສ່ວນປະກອບຂອງ Rocker arm ທັງຊຸດ.
10. ກວດເບິ່ງວ່າຝາສູບບໍ່ບິດງ້ຽວ.
11. ກວດຫາຄວາມບົກພ່ອງຂອງຝາສູບ ແລະ ລີ້ນສູບ.
12. ຖອດອອກ ແລະ ປ່ຽນເຄື່ອງທອງນ້ຳມັນ.
13. ປ່ຽນ Camshaft, Camshaft bearing, Timing gears, Chains, Gaskets, Seals ແລະ Valve filters.
14. ປ່ຽນ flywheel ແລະ Flywheel ring gear.
15. ປ່ຽນບ່ອນຕັ້ງຂອງເຄື່ອງ.
16. ປ່ຽນ Pistons, Piston rings, Gaskets ແລະ Seals.

17. ຕັ້ງລີ້ນສູບ (Valves).
18. ເຮັດການທົດລອງກວດລະບົບການຫຼໍ່ລື່ນເຄື່ອງຈັກ.
19. ເຮັດການທົດລອງກວດລະບົບຖ່າຍອາກາດເຄື່ອງຈັກ.

II. DRIVE TRAINS ສ່ວນທີ່ຂັບເຄື່ອນຂອງຣົດ.

1. ຕັ້ງສ່ວນທີ່ທຳກັບກະປຸກເກັຽທັມດາ.
2. ຕັ້ງ Clutch.
3. ແປງ Overdrive unit ໃຫ້ເປັນອັນໃໝ່.
4. ແປງກະປຸກເກັຽທັມດາໃຫ້ເປັນອັນໃໝ່.
5. ກວດເບິ່ງຢ່າງລະອຽດ ແລະ ແປງລະບົບຄວບຄຸມໄຟຟ້າ ແລະ ສ່ວນປະກອບ ຕໍ່ກັບ Overdrive unit.
6. ກວດຫາອັນຕິດຂັດຂອງ Differential ຢ່າງລະອຽດ.
7. ແປງ Hydraulic-type clutch.
8. ແປງຫຼື ປ່ຽນ Differential.
9. ປ່ຽນ Universal joints.
10. ປ່ຽນເພົາຂ້າງໜ້າຂອງມັນເປັນຈຸດ.
11. ແປງ ແລະ ຕັ້ງເພົາຂ້າງໜ້າເປັນຈຸດ.
12. ປ່ຽນ Mechanical-type clutch.
13. ປ່ຽນ Pinion seal.
14. ປ່ຽນ Pilot bearing.
15. ປ່ຽນເພົາຫຼັງ ແລະ ລູກປືນ ພ້ອມດ້ວຍ Seal.
16. ປ່ຽນ Speedometer drive gear.
17. ທົດລອງກວດ ການເຮັດວຽກຂອງເກັຽທັມດາ.
18. ປ່ຽນ Clutch release bearing(throw-out bearing).

III. AUTOMATIC TRANSMISSION: ກະປຸກເກັຽ ອັດໂນມັດ.

1. ຕັ້ງ ຂໍ້ຕໍ່ກັບພື້ນ (Floor linkage)
2. ຕັ້ງ Colump- Type linkage
3. ຕັ້ງ ຊ່ວງຕໍ່ ລາກເຊືອງ.
4. ວິເຄາະ ແລະ ຕັ້ງ Modulators
5. ປ່ຽນ ແລະ ຕັ້ງ Modulators.
6. ກວດ ແລະ ແປງ ລະບົບ ເຮັດໃຫ້ ກະປຸກເກັຽ ເຢັນ.
7. ກວດ ແລະ ຖອດອອກ ແລະ ປ່ຽນ Convertor.
8. ກວດ ແລະ ປ່ຽນ pump ໜ້າ, Seal ແລະ bushings.
9. ໃຊ້ເຄື່ອງເຮັດໃຫ້ Automatic Transmission ເຢັນ
10. ຕັ້ງ Band adjustments (ຂັ້ງ ນອກ-ໃນ).
11. ແປງໃຫ້ ເໝືອນໃໝ່.
12. ທ່າ ການກວດ Automatic Transmission
13. ຖອດອອກ ແລະ ຕິດຕັ້ງ Automatic Transmission.
14. ຕັ້ງ Safety Switch ສໍາລັບເກັຽວ່າງ.
15. ປ່ຽນ ແລະ ຕັ້ງ NEUTRAL SAFETY SWITCH.

IV. ELECTRICAL SYSTEMS: ລະບົບໄຟຟ້າ.

1. ວິຈັຍ ນີ້ ຕັ້ງເຄື່ອງໂດຍໃຊ້ Engine analyzes
2. ວິຈັຍສາເຫດຂອງການຈ່າຍໄຟຂອງຈານຈ່າຍ.
3. ວິຈັຍ ການຕິດຂັດຂອງ Starter.
4. ກວດເບິ່ງ Secondary circuit lead wires, distributor cap, ແລະ rotor. ວັດຄວາມຕ້ານທານພ້ອມ.

5. ກວດເບິ່ງ Ignition switch, resitor, ສາຍໄຟຕ່າງໆ ແລະ Coil ທາງ primary circuit.
6. ປ່ຽນ ແລະ ແປງ Switches.
7. ປ່ຽນ ຫຼື ແປງ Switch ແລະ Resistor.
8. ປ່ຽນ Ignition switch ແລະ Resistor.
9. ຕັ້ງ Ignition Timing ໄຟຂອງຈານຈ່າຍ.
10. ກວດເບິ່ງທອງຂາວ (points) ແລະ Condenses.
11. ປ່ຽນທອງຂາວ ແລະ Condenses.
12. ກວດເບິ່ງກຳລັງກະແສໄຟຂອງ Alternator ຫຼື Generator.
13. ປ່ຽນ ຫຼື ແປງ ອັນຄວບຄຸມການຕັດໄຟ.
14. ແປງ Generator ຫຼື Alternator.
15. ປ່ຽນ Generator ຫຼື Alternator.
16. ປ່ຽນ ແລະ ຕັ້ງຈານຈ່າຍ.
17. ຕັ້ງໄຟຂອງຈານຈ່າຍ ແລະ ຕົບແຕ່ງ ຫຼື ທຳໃຫ້ Advance curves.
18. ປ່ຽນສາຍໄຟດິນຣົດ ແລະ ປຸ່ມບ່ອນຄຸມເຄື່ອງ.
19. ປ່ຽນ Solenoids.
20. ແປງ Starters.
21. ປ່ຽນ Starters.
22. ແປງ ຫຼື ປ່ຽນ Fuse box assembly.
23. ແປງ ຫຼື ປ່ຽນ ສ່ວນປະກອບຂອງຣະບົບໄຟ.
24. ປ່ຽນ Flasher unit.
25. ທົດລອງສອບ ແລະ ແປງ cruise control units.
26. ທົດລອງສອບ ແລະ ຕໍ່ສາຍໄຟບ່ອນໜ້າປັດ.
27. ກວດເບິ່ງ ແລະ ທົດລອງສອບ Motor ສຳລັບ ປັດໜ້າແວ່ນຣົດ, ກ້ານປັດ ແລະ ໃບປັດ.

28. ແປງສ່ວນປະກອບຂອງເຄື່ອງປັດແວ່ນຈອດ ແລະ ປຸ່ມຄວບຄຸມ.
29. ທົດລອງສອບ ແລະ ແປງ Transistor Ignition Systems.

V. CARBURETOR AND EMISSION: ເຄື່ອງປະສົມນ້ຳມັນກັບອາກາດ ແລະ ລະບົບຖ່າຍເທຂອງອາກາດຂອງເຄື່ອງຈັກ.

1. ຮຽນຮູ້ກ່ຽວກັບເຄື່ອງຄວບຄຸມອາກາດບໍ່ດີ (ທີ່ຂັດ).
2. ຮຽນຮູ້ P.C.V. ແລະ ລະບົບຖ່າຍເທ ແລະ ຄວບຄຸມຂອງເຄື່ອງ (ທີ່ດະລີ).
3. ຮຽນຮູ້ຫຼັກຂອງ P.C.V ແລ້ວ ແລະ ການຕັດແປງເຄື່ອງ (ທີ່ຂັດ).
4. ຊີ້ແຈງລະບົບ Exhaust emission control (ທີ່ຂັດ).
5. ຊີ້ແຈງລະບົບ Exhaust emision control.
6. ຕັ້ງ infra-red machine.
7. ທົດລອງສອບລະບົບ Hydrocarbon ແລະ Carbon monoxide.
8. ຕັ້ງ Carburetor.
9. ແປງ ແລະ ບໍລິການ Carburetor.
10. ວິໄຈຄວາມຊື້ນ ແລະ ສິ່ງຂອງຕົກຄ້າງຢູ່ໃນລະບົບນ້ຳມັນ.
11. ຕັ້ງ Choke unit (ອັດຕະໂນມັດ ຫຼື ທັນຕາ).
12. ກວດແປງ ແລະ ຄັ້ງ ແລະ ຕັ້ງ Choke unit (ທັນຕາ ຫຼື ອັດຕະໂນມັດ).
13. ປຸ່ມລະບົບຈັດນ້ຳມັນໃນຖັງນ້ຳມັນ.
14. ວັດການໄຫຼຂອງນ້ຳມັນ ແລະ ກຳລັງດັນ.
15. ກວດສອບລະບົບ Exhaust emission control.
16. ກວດສອບລະບົບ Evaporative emission control.
17. ບໍລິການ ຫຼື ແປງທໍ່ຄວາມຮ້ອນ ແລະ ເຄື່ອງຄວບຄຸມ.
18. ຖອດລອດ ແລະ ປຸ່ມປັ້ມນ້ຳມັນ.

19. ແປງ ແລະ ປ່ຽນສາຍນ້ຳມັນ.

VI. **STANDARD AND POWER STEERING:** ລະບົບພວງມາໄລແບບທັມມະດາ ແລະແບບໃຊ້ກຳລັງລົມຊ່ວຍ.

1. ຕັ້ງ Worm gear ແລະ Sector ໃນລະບົບພວງມາໄລ.
2. ປ່ຽນ Steering spindles.
3. ກວດເບິ່ງ Steering gear.
4. ກວດເບິ່ງ Steering linkage.
5. ອັດຈາຣະບີໃຫ້ Stering gear ແລະ linkage.
6. ຕັ້ງ Power Stéering unit ແລະ ລະດັບ Fluid.
7. ແປງໃຫ້ເໝືອນໃໝ່ ກ່ຽວກັບ Power Steering units.
8. ແປງ Power steering pumps.
9. ປ່ຽນ Steering gear components.
10. ປ່ຽນ Power steering components.
11. ປ່ຽນ Power steering pumps.
12. ປ່ຽນ Filter ໃນ power steering.

VII. **BRAKING SYSTEMS:** ລະບົບຫ້າມລໍ້ (ເບຣກ).

1. ຜັນເບົ້າຫ້າມລໍ້ໃຫ້ໄຕ້ງກັນ.
2. ຕັ້ງຂໍ້ຕໍ່ຂອງ Parking brake.
3. ຕັ້ງຫ້າມລໍ້ມື ແລະ band ຂ້າງນອກ.
4. ປ່ຽນຫ້າມລໍ້ມື band ຂ້າງນອກ.
5. ເຮັດໃຫ້ສາຍຫ້າມລໍ້ມືເຄື່ອນທີ່ໄດ້.
6. ກວດເບິ່ງ ແລະ ປ່ຽນເບົ້າຫ້າມລໍ້ (disc brakes).
7. ກວດເບິ່ງ ແລະ ເຮັດການຫ້າມລໍ້ລຸຍ (disc brakes).

8. ກວດເບິ່ງ ແລ. ຜົນ ຄຸນ ຂອງ brake.
9. ກວດເບິ່ງ ແລະ ປ່ຽນ ບ່ອນທັງ ຜ້າ brake ຄືວຕົນເອງ.
10. ເຮັດ ການທົດລອງ brake.
11. ເຮັດໃຫ້ ຂອບ ຜ້າ ດຸມ ດ້ານ ນັ້ງ ຕໍ້ ເໝືອນໃໝ່.
12. ແປງ disc brake Calipers.
13. ແປງ Master cylinder.
14. ປ່ຽນ Master cylinder.
15. ແປງ Brake power unit ໃຫ້ ເໝືອນໃໝ່.
16. ແປງ Self-adjuster.
17. ແປງ Wheel cylinder.
18. ປ່ຽນ Wheel cylinder.
19. ປ່ຽນ ຜ້າ brake (Brake shoes).
20. ປ່ຽນ Hydraulic control valves.
21. ປ່ຽນ Hydraulic brake power units.
22. ປ່ຽນ Hydraulic power cylinder.
23. ປ່ຽນ Parking brake linkage.

VIII. FRONT ENDS: ຊ່ວງ ໜ້າ ຂອງ ຣົດ.

1. ຕັ້ງ Torsion bars.
2. ປ່ຽນ Torsion bars.
3. ຕັ້ງ ແລະ ກວດເບິ່ງ ລູກປືນ ເພົາ ໜ້າ ຂອງ ລໍ້.
4. ຕັ້ງ ລໍ້ ແລະ ພວງ ໃດ ໄປ ເຄື່ອງ.
5. ກວດເບິ່ງ ແລະ ຕັ້ງ ຊ່ວງ ໜ້າ ຂອງ ລໍ້ (Front end).
6. ກວດສອບ ແລະ ປ່ຽນ Steering damper.
7. ກວດເບິ່ງ ລະບົບ Suspension.

8. ກວດສອບ ແລະ ແປງລະບົບ Suspension ຂ້າງໜ້າ.
9. ໃສ່ King pins or link pins.
10. ແປງ ລະບົບ Suspension ຂ້າງຫລັງ.
11. ປ່ຽນ Ball joints.
12. ປ່ຽນ ລູກປືນເພົາຂອງລໍ້ໜ້າ ແລະ grease seal.
13. ປ່ຽນ Suspension control arm ແລະ bushings.
14. ປ່ຽນ ລະບົບ Suspension ຂ້າງຫຼັງ.

IX. COOLING SYSTEMS: ລະບົບເຮັດໃຫ້ເຄື່ອງເຢັນໃນເຄື່ອງຈັກ.

1. ກວດແປ້ງ ອຸນນະພູມຂອງເຄື່ອງ.
2. ກວດແປ້ງ ຖັງນ້ຳ ທີ່ ສຳລັບ ນ້ຳ ລົ້ນອອກມາ.
3. ໃຊ້ນ້ຳ ຢາ ລ້າງ ລະບົບເຮັດຄວາມເຢັນ.
4. ກວດແປ້ງຮ່ອມປະສົມຂອງລະບົບເຮັດຄວາມເຢັນ.
5. ໃຊ້ກຳລັງອັດ ກວດແປ້ງ ລະບົບເຮັດຄວາມເຢັນ.
6. ເຊື່ອມ ຄົວ ທໍ່ ບ່ອນ ຮົ່ວ ຂອງ ຮັງແຜ້ງຂອງ ໝໍ້ ນ້ຳ.
7. ທົດລອງ Thermostat.
8. ປ່ຽນ Thermostat.

X. HEATER: ເຄື່ອງເຮັດຄວາມຮ້ອນໃຫ້ຣົດອຸ່ນ

1. ກວດຫາບ່ອນຕິດຂັດຂອງລະບົບເຮັດຄວາມຮ້ອນ.
2. ປ່ຽນ Heater control units.
3. ຖອດອອກ ແລະ ປ່ຽນໃສ່ທາງຂອງ heater.
4. ແປງ Heater core.
5. ບໍລິການ ສ່ວນປະກອບຂອງ Heater control.

XI. AUTOMOBILE AIR CONDITIONERS: ເຄື່ອງເຮັດຄວາມເຢັນພາຍໃນ ຣົດ.

1. ຕິດຕັ້ງ ເຄື່ອງເຮັດ ຄວາມເຢັນໃນຣົດ.
2. ກວດຫາ ຂໍ້ບົກພ່ອງ ຂອງ ເຄື່ອງເຮັດ ຄວາມເຢັນ.
3. ຖອດລະບົບ ເຮັດຄວາມເຢັນ ອອກໃຫ້ ໝົດ.
4. ກວດເບິ່ງ ແລະ ໃສ່ ນ້ຳຢາ ເຮັດໃຫ້ເຢັນ (refrigerant). ເພີ່ມເຕີມ.
5. ໃຊ້ກຳລັງ ດັນ ທົດສອບ ລະບົບ ເຮັດ ຄວາມເຢັນ.
6. ທົດສອບການຮູ້ ຂອງ ລະບົບ ເຮັດ ຄວາມເຢັນ
7. ແປງ Compressor ຂອງ ລະບົບເຮັດຄວາມເຢັນຂ້າງໃນ ຣົດ.
8. ປ່ຽນ compressor ຂອງລະບົບເຮັດຄວາມເຢັນຂ້າງໃນຣົດ.
9. ແປງ ວົງຈອນຂອງສາຍໄຟ.
10. ແປງ Va cuum circuits.
11. ປ່ຽນ condenser ໃນເຄື່ອງເຮັດໃຫ້ອາກາດເຢັນ.
12. ປ່ຽນ Compresser seals.
13. ປ່ຽນ Fan motor ຂອງ air conditioner.
14. ປ່ຽນ Evaporator.
15. ປ່ຽນ Drier ໃນ air conditioner.
16. ປ່ຽນ Expansion valve.
17. ປ່ຽນ Evaporator control valve ຫຼື diaphragm.
18. ແປງ ສາຍໄຟ ຂອງ air conditioner.
19. ແປງ ເຄື່ອງເຮັດຄວາມຮ້ອນ ແລະ ເຢັນ ແບບ ອັດ ໂນມັດ.

Technical Lexicon:

English
English/Spanish
English/Laotian

CE029796

AUTOMOTIVE MECHANICS TECHNICAL TERMS

CAREER DEVELOPMENT CENTER
SCHOOL OF TECHNICAL CAREERS
SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE, ILLINOIS

AUTOMOTIVE MECHANICS TECHNICAL TERMS

MASAKO T. SHIN, CURRICULUM SPECIALIST, STC, SIU-C

The preparation of this multicultural series was aided financially through funding agreements with the Illinois State Board of Education/Department of Adult, Vocational and Technical Education.

(Contract Numbers: R-33-10-C-0442-400, R-33-21-J-0542-400)

June 1981

ARDEN L. PRATT, DEAN
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AUTOMOTIVE MECHANICS: Technical Terms

AC,ac: alternating current; an electric current which changes its direction, or alternates back and forth in its direction of flow.

accessories: devices in a vehicle that are not necessarily essential for its operation: heater, radio, air-conditioning, etc.

adapter: a device by which objects of different sizes are made interchangeable.

advance: means to set the ignition timing so that a spark occurs earlier.

air gap: a space between contact points, spark plug electrodes, generator armatures, field shoes, etc.

alternator: a generator that produces alternating current.

ambient temperature: the temperature surrounding an electrical part; on regulators, measured with a thermometer positioned approximately one inch away from the regulator cover.

ammeter: a device used for measuring current flow, in amperes, between different points of an electrical circuit.

amperage: the amount of current flow measured in amperes.

amperage draw: the amount or quantity of current necessary for the operation of electrical devices.

ampere: a unit of measurement for the flow of an electrical current.

anode: the positive pole in an electrical circuit.

armature: the movable part of a generator, consisting of coils of wire wound around an iron core, which moves through a magnetic field to produce an electrical current.

armature coil: a section of armature winding prepared to the exact shape required to fit into the slots of the armature core.

AUTOMOTIVE MECHANICS: Technical Terms (cont.)

battery: a group of two or more electrical cells connected together within a battery case to produce an electric current; converts chemical energy into electrical energy; stores electrical energy in a chemical form.

bearing: an area of unit in which the contacting surface of a revolving part rests; a piece in which a shaft or other moving parts revolve.

block: that part of the engine containing the cylinders.

bore: refers to the cylinder or to the diameter of the cylinder.

brush: a block of conducting material, such as copper or carbon, which bears against a commutator or a slip ring to form a passage for electrical current.

bushing: a metallic substance between two plates; a perforated metal lining to guard against friction and corrosion.

calibrate: to adjust for determining the graduations used on a test instrument so that it will operate properly.

cam: a device which changes a rotary motion to a linear motion.

camber: tilt of a wheel, outward or inward from the center line, at the top of wheel assembly.

carbon monoxide: poisonous gas caused by incomplete burning of gasoline or other fuels.

carbon pile: a stack of carbon discs enclosed within an insulating tube and connected to a control knob which presses them together or loosens them in order to vary resistance to an electric current; used in all types of rheostat.

carburetor: a device used to mix gasoline and air in the correct proportion.

car stand: a simple device to support the weight of the car off the floor.

caster: tilt of the front suspension or spindle - forward or backward for directional stability.

cathode: the negative pole in an electrical circuit.

charge or recharge: to put a charge in or restore the active materials in a battery by passing current through it in the opposite direction of discharge.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

charging rate: the amount of current flowing from the generator or the alternator to the battery.

chassis: a term which denotes everything in the car except the body and fenders; the underpart of an automobile.

chock: a wedge or block for steadying a body and holding it motionless.

circuit: the arrangement of a complete path along which an electric current flows; see parallel circuit, series circuit and series-parallel circuit.

circuit breaker: a combination relay and solenoid; also a protective device used for overload circuit.

clearance: a given amount of space between two parts.

combustion: the act or state of burning.

commutator: a device used to reverse the direction of an electric current; cylindrical in shape, consisting of copper bars or segments that are insulated from each other; located between an armature and a set of brushes.

compression: pressure applied to a gas causing a reduction in volume.

condense: to change a vapor back into a liquid.

condenser: a device used as a "storage place" for an electric charge; most often used to reduce arcing, also known as a capacitor. A radiator-like heat exchanger, in which refrigerant vapor loses heat and returns to a liquid state.

conductor: a material, a substance or a body, such as wire of other metallic objects, with the capability of transmitting electricity.

connecting rod: the connecting link between the piston and the crankshaft.

connector: a device used for connecting electrical parts and circuits.

current: a movement or flow of electricity; electric current; measured in amperes.

current limiter: a relay used to open a circuit when the current reaches its limiting value and to close the circuit when the current falls below its limiting value.

cutout relay: a device used to open and close the circuit between the generator and the battery, charging the battery when it is in need of a charge and preventing battery discharge when the generator is not operating.

cycle: in a given sequence, a series of events that occur over and over; in batteries, the constant charging, discharging and recharging.

dapener: a unit used on the front end of the crankshaft to reduce engine vibration.

DC,dc: direct current; a current flowing in one direction only and not alternating.

dielectric: an insulator.

diode or diode rectifier: a device used to change alternating current to direct current.

distortion: a change from the normal in shape or size.

drilling: an operation of producing a circular hole by removing solid metal.

eccentric: off center.

electrolyte: a solution of sulfuric acid and distilled water used in lead-acid storage batteries to produce voltage and current by chemical decomposition.

engine: a power generating unit of a car.

engine drag: the friction between the engine's many moving parts that come into contact with each other.

exhaust manifold: the hollow casting through which the gasses from the various cylinders are conducting their way through the exhaust pipe and through the muffler.

expander: a device installed to increase size as within a piston or under rings.

field: the area in which a magnetic flow occurs; shortened form for field oils, field magnet, field windings, etc.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

field coil: a coil, or winding or many windings of wire surrounding a field pole which produces a magnetic field as current passes through it.

fins: a functional form to direct air and absorb temperature for cooling.

fluid friction: a resistance of a liquid to flowing.

frame: a foundation on which the car is built; provides support for the engine, power train wheels, springs, brakes, and steering system.

friction: a force that interferes with the sliding motion of one body over another.

fuse: an electric safety device, consisting of a glass tube with a soft metal strip, enclosed within, that melts or blows out if an excessive current flows through it.

galling: a characteristic of metals which causes them to seize or "freeze" when brought into contact with each other under pressure and no lubricant.

gasket: a special lining used for packing or sealing; a unit used between two pieces or objects for the purpose of sealing.

gassing: formation of gasses which escape from a battery through the vent caps during battery charging.

generator: the part of the electrical system which converts or changes mechanical energy into electrical energy.

gravity: see "specific gravity."

grinding: an operation which removes a small amount of metal from the surface of stock by abrasion.

ground: a connection made to ground a circuit: it uses the automobile frame, body and engine to form half of the electrical circuit.

growler: an audible testing device for armature.

heat sink: a heat transfer device used to prevent overheating; usually made of a special material which absorbs heat from a certain object or part and transfers it to another.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

hone: sharpen, enlarge, or smooth with a fine-grit stone called a hone.

housing: a casing or container, with or without a cover, used to enclose parts of any kind.

hydrometer: a floating instrument used to measure the specific gravity or density of battery electrolyte.

hypoid: refers to a set of gears wherein the pinion intersects the ring gear below the center line of the rear axle shaft; used to lower body level for a greater pinion teeth contact with the ring gear and for a longer life of the ring gear and the pinion.

I.D.: inside diameter.

impluse: refers to a momentary acceleration given to the speed of engine crankshaft by a starter motor armature to produce starting, an increase of vacuum, or an advance of timing position.

insulator: a non-conductive material, substance or body used for insulating wires, commentator bars, etc.

internal combustion engine: an engine which burns fuel internally.

jet: a metering orifice of exact size used to control the flow of gasoline in various parts of the carburetor.

key: a straight or half moon shaped piece of metal which fits into slots in the shaft and hub on a pulley or gear; the key locks the pulley or gear to the shaft.

light-load test: a test for storage batteries performed while the battery is subjected to a light load.

linkage: movable bars or links connecting one unit to another.

lock washer: a washer used between a nut, a head of a bolt, or a screw and the machined part.

machining: a term used to describe operation involving the use of machines which have been used to change the shapes, to refinish the surface, or to drill a hole.

magnetic switch: a unit used to complete another circuit by the use of an electromagnet.

mica: an insulating material in electrical equipment, especially the commentator bars of a DC generator, starter motor, etc.

micrometer: a device used to measure accurately to the one-thousandth (1/1000) of an inch.

mike: a short term for a micrometer or the use of one.

milling: an operation on metal surfaces by rotary cutters to shape, to finish, or to transform.

motor: a device which operates on power from another source.

negative: indicating a kind of electricity; a negative pole is the point which an electric current flows from; in magnetism, the south pole.

nonconductor: see "insulator."

ohm: a unit used for measuring electrical resistance.

ohmmeter: a device used for measuring electrical resistance in ohms.

open circuit: the breaking of a circuit (usually unintentional) through a broken or disconnected wire or loose terminal connection.

overcharging: the continued charging of a battery beyond its fully charged condition.

parallel circuit: a circuit in which all the negative terminals are connected to all negative poles, terminals etc., and all positive terminals are connected to all positive poles, terminals, etc.

parts common: a term used to mean gas line fittings, rivets, bolts, nuts, screws, pipe fittings, etc. used on all models of cars, trucks, tractors, lawn mowers, chain saws and small engines.

plate: to deposit on a surface; a sheet of material uniform in thickness.

polarizing generator: correcting the polarity of the generator field so the generator will build up correct polarity with respect to the battery it is to charge; reverse polarity reverses the residual magnetism in the pole shoes and causes the generator to build up backwards, which produces arcing and burning of the cutout relay points and fails to charge the battery.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

positive: indicating a kind of electricty; in magnetism, the north pole.

primary circuit: the part of the system which develops the power to car voltage for use by all circuits in the primary system.

punch: a rod-like tool with a tapered or straight shank at one end: start punches are often called drifts.

quick charger: a battery charger that produces a very high charging current to boost a battery in a relatively short period of time.

reaming: an operation in which the inside of a hole is sized and finished by the use of a reamer.

reciprocating action: a back and forth movement such as the action of the pistons.

recirculating ball worm and nut: a popular type of steering gear utilizing a series of ball bearings that feed through and around and back through the grooves in the worm and nut.

rectifier: see "diode rectifier."

regulator: a device in the electrical system used to prevent the excessive voltage and/or generator output.

relay: a device used to open or close an electrical circuit.

resistance: electrical friction that opposed the passage of an electric current.

resistor: a device placed in a circuit to lower voltage.

rheostat: a device for regulating electrical current, in which the current is made to flow through wires having considerable resistance.

ring job: a reconditioning of the cylinders and installation of new rings.

rotor: a rotating unit for distributing current from a center point to as many connections as may be desirable to use; a revolving part of a machine, such as an alternator rotor, a disk brake rotor, a distribution rotor, and a Wankel engine rotor.

rpm: revolutions per minute.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

score: a scratcher groove on a finished surface.

seal: a unit installed to prevent lubrication from flowing or leaking to the outside of a unit.

seat: the stationary part which provides a leak-proof contact when the valve head or plunger is in a closed position.

series-circuit: a circuit arranged in such a way that the electrical devices are connected through each other, end to end, so that the same current flows through all. If any one device in the circuit is turned off, the circuit is broken and none of the other devices of the circuit will operate; positive terminals are connected to negative terminals.

series-parallel circuit: a combination of both series- and parallel-circuits working together.

shim: a thin spacer installed between two units to increase the distance between them.

short or short circuit: the unintentional (sometimes intentional) grounding of a circuit; a defect in a circuit, such as an insulation breakdown, causing current to take a short path instead of following its designated path.

shunt: a connection of two points to form a parallel circuit.

shunt generator: a generator with the field windings connected in parallel with the armature, being shunted across the armature.

slip rings: a set of rings, usually two, located between the armature windings and brushes, forming the rotating connections of an AC generator.

sludge: a creamy, black deposit with the consistency of soft mud, formed when water mixes with engine oil.

soldering: a process involving use of heat and a fusible alloy, called solder, to bind metals together.

solenoid: an electromagnet with a movable shaft, iron core.

solid friction: a sliding or rolling friction.

specific gravity: a weight ratio per unit volume of any substance as compared to the weight of another substance as a standard unit; usually water for solids and liquids, and air for hydrogen or gasses.

spline: a key in the form of a flat strip for insertion in a slot or groove between parts; in automobiles, splines.

stator: 1. for automatic transmission - a small hub with vanes affixed radially; so placed that oil leaving the torque converter strikes the stator vanes and is redirected into the pump at an angle to develop high efficiency.
2. for generator - the stationary part of an AC generator about which the rotor assembly revolves.

step-voltage control: a generator regulating device which operates in two steps to control a relatively high or low output.

storage battery: see "battery."

strut: an aligning unit used for alignment in any direction: up, down, across, lengthwise.

synchronize: to bring about timing which will cause two or more events to occur simultaneously.

tachometer: a device which indicates the speed of the engine in rpm (revolutions per minute).

tapering: a sizing operation for round work, giving considerations to (1) the amount of taper per foot; (2) the large diameter; (3) the length of the taper; and (4) the small diameter.

tappet: a unit used between a cam shaft and a valve push rod to operate the valve operating mechanism properly.

TC (two-charge) regulator: see "step-voltage control."

terminal: a device at the end of a wire, cable or electrical part for making electrical connections practical.

third-brush generator: a generator with its output controlled by a movable third-brush connected to the field circuit.

three phase: a term used to denote the three points of a stator winding that are connected together for the generation of alternating current.

timing: an adjustment of valves and the crankshaft of an engine in their relative positions to produce the greatest effective output in horsepower; the point at which the ignition breaker is set in relation to the top dead-center position of the piston to secure the greatest effective expansive force upon the head of the piston.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

torque: a turning effect or a twisting force.

torus: a unit used for developing power through the use of oil by both a driving and a driven unit.

transformer: a device whereby electrical currents are changed in regard to voltage and amperage from high to low, or vice versa.

transistor: a semiconductor device used to amplify voltage and/or current.

valve ports: openings leading into the cylinders.

venturi: a restriction in the air stream which reduces the pressure around the fuel delivery nozzle so that liquid gasoline sprays out in the form of a fine mist.

viscosity: evidenced by the resistance of liquids to flow.

volt: the standard unit of electromotive force for measuring current pressure in a circuit.

voltage: electric pressure expressed or measured in volts.

voltage drop: a reduction in voltage across a resistance in circuit, connection, electrical equipment, etc.

voltage regulator or voltage limiter: a device which controls the amount of voltage delivered from the generator to the battery by repeatedly inserting a resistance into the generator field cirucit.

voltmeter: a device used for measuring electrical potential in volts, between different points of an electrical circuit.

water jacket: an area around the cylinders and valves that is left hollow so that the water can enter for cooling.

winding: a wire coiled about itself or about an object; often identified as field winding, series winding, shunt winding, etc.

AUTOMOTIVE MECHANICS: Equipment and Tools

1. air blow guns
2. air chisel
3. air compressor 5 h.p.
4. air conditioning repair equipment
5. air hoses: 50 ft. length, 1/4 in. inside diameter
6. alignment bar
7. ammeter
8. arbor press
9. automatic transmission bench fixture
10. automatic transmission gauges
11. automatic temperature control testers
12. automatic transmission tool set
13. ball joint checker
14. battery carrier
15. battery charger
16. battery hydrometer
17. battery jumper cables
18. battery servicer kit
19. battery storage: 6 volt
20. battery storage: 12 volt
21. bay lift
22. belt tension gauge
23. bench, work
24. bolt cutter

AUTOMOTIVE MECHANICS: Equipment and Tools (cont'd)

25. boring bar
26. brake cylinder: hone
27. brake drum lathe
28. brake pressure bleeder diaphram type
29. brake rivet machine
30. brake shoe arc grinder
31. buffing and wire wheel
32. bushing installer set
33. calipers: assorted
34. cam bearing installer
35. can: safety, gasoline
36. can: water
37. carburetor-distributor adjusting tool
38. carburetor tool kit
39. cart: service
40. C-clamps: assorted
41. chain fall
42. chain pull wrench
43. channel locks
44. chassis dynamometer
45. cherry picker: a crane; rigger with extension boom
46. chisel and punch set
47. coil spring compressor
48. coil spring spreader

AUTOMOTIVE MECHANICS: Equipment and Tools (cont'd)

49. compression gauges
50. connecting rod aligner
51. continuity light
52. cooling system chemical tester
53. crankshaft grinder
54. creeper; flat
55. creeper, seat: with casters
56. cylinder dial indicator gauge
57. deglazer
58. diagonal cutting pliers
59. dial indicator
60. differential holder
61. diode tester
62. diode tool set
63. disc brake lathe
64. distributor tester
65. distributor wrenches
66. drill bits: assorted
67. drill press
68. drills, air
69. drills, electric: assorted
70. drop light or trouble light
71. electric arc welder
72. electronic ignition tester

AUTOMOTIVE MECHANICS: Equipment and Tools (cont'd)

73. engine analyzer: complete with scope and emissions tester

74. engine oil leak detector

75. engine sling: adjustable

76. engine stand

77. exhaust pipe expander

78. feeler gauges: assorted

79. fender covers

80. files: assorted

81. flaring tool kit

82. flywheel turner

83. fuel pump tester

84. gear and bearing pullers

85. generator-alternator test bench

86. glass bead cleaner

87. grinder: bench

88. grinding wheel dresser

89. growler

90. hack saws

91. hammers: assorted

92. hand jacks: assorted

93. head lamp aimer

94. head lamp intensity meter

95. head surfacer

96. hose clamp: pliers

AUTOMOTIVE MECHANICS: Equipment and Tools (cont'd)

97. hot tank cleaner
98. hydraulic press
99. hydraulic valve lifter tools
100. hydrometer float: antifreeze tester
101. jack stands
102. lathe
103. lifts
104. lubrication equipment
105. measuring tape
106. metal marker, electric
107. micrometers: assorted
108. mirrors, inspection
109. needle-nosed pliers: assorted
110. ohmmeter
111. oil drain pans
112. oil filter wrench
113. oiling cans
114. oil measure
115. parts cleaning tank
116. pipe wrench
117. piston expander tool
118. piston pin hole hone
119. piston pin installing kit
120. piston-ring groove cleaner

AUTOMOTIVE MECHANICS: Equipment and Tools (cont'd)

121. piston-ring remover and installer
122. pressure pack flushing gun
123. racks: piston and connecting rod holders
124. regrooving tool, piston
125. ridge reamer
126. scratch awl
127. screwdriver: clutch head attachments, assorted
128. screwdrivers: Phillips
129. screwdrivers: standard set
130. screw thread gauge
131. seal installer set
132. seal removers
133. service jacks: assorted
134. slip joint pliers: assorted
135. snap rings plier set
136. snap ring pliers truarc: internal/external
137. snips, tin: assorted
138. soldering iron or gun
139. spark plug cleaning machine
140. spring tension
141. stamps, steel: letters and numbers
142. steam jenny: a high pressure steam or combination cleaner
143. straight edge
144. suction gun
145. tack dwell units

AUTOMOTIVE MECHANICS: Equipment and Tools (cont'd)

146. tap and die set
147. terminal kit and crimping tool
148. test lights: high voltage and low voltage
149. thermostat tester
150. thread chaser
151. tie-rod end remover
152. timing light
153. tire bead expander
154. tire gauges
155. tire service machine
156. tire tube leak detector tank
157. torque converter flusher
158. transmission funnels
159. transmission jack
160. tubing wrenches
161. U-joint press
162. undercutter
163. utility chain with hooks
164. valve guide replacement tool
165. valve guide resizing tool
166. valve seat insert tool
167. valve reconditioning equipment
168. valve spring compressor
169. valve spring tester
170. vise grip pliers

AUTOMOTIVE MECHANICS: Equipment and Tools (cont'd)

171. vise, machinists: assorted

172. volt-amp tester

173. voltmeter

174. welding equipment, oxyacetylene

175. wheel alignment equipment

176. wheel balancer, bubble

177. wheel balancer, spin-type

178. wheel balancer, strobe

179. wheel lug wrench: x-type; 4-way

180. wheel puller

181. wrench drive adapters

182. wrenches: adjustable set

183. wrenches: air impact

184. wrenches: Allen

185. wrenches: box

186. wrenches: ignition set

187. wrenches: open-end and combination box wrench set

188. wrenches: socket set, 1/2 in. drive

189. wrenches: socket set, 3/8 in. drive

190. wrenches: socket set, 3/4 in. drive

191. wrenches: socket set, 1/4 in. drive

192. wrenches: torque, inch/lbs.

193. wrenches: torque, foot/lbs.

AUTOMOTIVE MECHANICS TECHNICAL TERMS

ENGLISH-SPANISH LEXICON

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ENGLISH-SPANISH LEXICON

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AUTOMOTIVE MECHANICS: Technical Terms

MECANICA DE AUTOMOVILES: Terminología Técnica

AC, ac: corriente alterna

accessories: accesorios

adapter - adaptador: un dispositivo que hace intercambiable unas piezas

advance: avance

air gap: entrehierro

alternator: alternador

ambient temperature: temperatura del aire ambiente

ammeter: amperímetro

amperage: amperaje

amperage draw: consumo en amperios de electricidad por un aparato

ampere: amperio

anode: ánodo

armature: inducido (del dinamo o alternador), armadura (motores)

armature coil: bobina del inducido

battery: batería, acumuladora

bearing: cojinete

block: bloque

bore: diámetro del cilindro

brush: carbón, escobilla de carbón (de cobre, etcétera)

bushing: manguito

calibrate: calibrar

cam: leva, excéntrica

AUTOMOTIVE MECHANICS: Technical Terms

MECANICA DE AUTOMOVILES: Terminología Técnica

camber: inclinación de la rueda (convergencia de las ruedas delanteras en proyección vertical), inclinación de la mangueta con la horizontal

carbon monoxide: monóxido de carbono

carbon pile: resistencia elaborado de placas de carbón

carburetor: carburador

car stand: estante (en que soportar un coche)

caster: inclinación del eje delantero

cathode: cátodo

charge or recharge: carga o recarga de una batería

charging rate: índice de carga

chassis: chasis, armazón

chock: cuña, calza, taco

circuit: circuito

circuit breaker: cortador

clearance: espacio libre entre las piezas u órganos de una máquina

combustion: combustión

commutator: conmutador, colector (dinamos)

compression: compresión

condense: condensar

condenser: condensador

conductor: conductor

connecting rod: biela

connector: conector, junta, etcétera

current: corriente

AUTOMOTIVE MECHANICS: Technical Terms

MECANICA DE AUTOMOVILES: Terminología Técnica

current limiter: limitador de corriente

cutout relay: relé para corte de corriente

cycle: ciclo

dampener: amortiguador

DC,dc: corriente directa

dielectric: dieléctrico (insulador)

diode or diode rectifier: rectificador de diodo

distortion: distorción

drilling: el acto de taladrar

eccentric: excéntrico, no centrado

electrolyte: electrolito (solución de agua destilada y ácido sulfúrico en la batería)

engine: motor

engine drag: el total de la fricción entre las partes que trabajan entre sí en el motor

expander: ensanchador

field - campo: en breve, se aplica a todas las piezas en que hay corriente magnética, los bobinas del campo inductor, el electroimán, el devanado de excitación, etcétera

field coil: bobina del campo, bobina inductora

fins: aletas

fluid friction: rozamiento de una parte con un fluido, resistencia de un fluido al flujo

frame: armazón, chasis

friction: fricción

AUTOMOTIVE MECHANICS: Technical Terms

MECANICA DE AUTOMOVILES: Terminología Técnica

fuse: fusible

galling: la característica de los metales que causa que se adhieran y se excorien cuando están en contacto sin lubricante

gasket: junta

gassing: burbujeo, desprendimiento de gases al final de la carga de la batería

generator: dínamo

gravity: véase "specific gravity"

grinding: el rectificado (con muela abrasiva)

ground - tierra: la conexión de la batería al armazón (chasis) para que se forme la mitad del circuito

growler: probador de inducido

heat sink: un dispositivo de termotransferencia empleado para prevenir que se recaliente un aparato

hone: afilar con piedra de aceite

housing - caja, bastidor, cárter, empotramiento, caparazón: cualquier tipo de cubrimiento para las partes de una máquina

hydrometer: hidrómetro

hypoid: engranaje hipoide

I.D.: diámetro interior

impulse: impulso, arranque, accelaración temporal

insulator: aislamiento, aislador

internal combustion engine: motor de combustión interior

jet: surtidor, esprea (del carburador)

AUTOMOTIVE MECHANICS: Technical Terms

MECANICA DE AUTOMOVILES: Terminología Técnica

key: chaveta, cuña

light-load test: prueba de marcha con poca carga

linkage: articulación, acoplamiento

lock washer: arandela de seguridad

machining: maquinado, labrado, elaboración por máquina

magnetic switch: interruptor magnético

mica: mica, un aislamiento

micrometer: micrómetro

mike: micrómetro, medir o probar con micrómetro

milling: fresado, trabajar o elaborar on máquina fresadora

motor: motor

negative: negativo

nonconductor: aislador

ohm: ohmio

ohmmeter: ohmímetro, ohmiómetro

open circuit: circuito abierto

overcharging: sobrecarga

parallel circuit: circuito en paralelo

parts common: piezas comunes o intercambiables entre varias máquinas y modelos de máquina. Se refiere a todos los remaches, tornillos, tuercas, tubería, etcétera para coches, camiones, tractores, cortapastos, sierras de cadena, y pequeños motores de gasolina

plate: electrodepositar, metalizar

polarizing generator - polarización de un dinamo: se trato de la corrección de la polaridad de un dinamo para que corresponda a la de la batería

AUTOMOTIVE MECHANICS: Technical Terms

MECANICA DE AUTOMOVILES: Terminología Técnica

positive: positivo

primary circuit: circuito primario

punch: punzón

quick charger: cargador rápido de baterías

reaming: acabado del interior de una perforación o agujero con un escariador

reciprocating action: acción recíproca (de los pistones)

recirculating ball worm and nut: dirección por sinfin y tuerca, con bolas recirculantes

rectifier: ver "diode rectifier"

regulator: regulador (que previene el voltaje excesivo y/o producción eléctrica del dinamo).

relay: relé

resistance - resistencia: se refiere a la fricción que resiste el paso de la corriente eléctrica

resistor - resistor: se coloca en el circuito eléctrico para reducir el voltaje

rheostat: reóstato

ring job: reacondicionamiento de los cilindros y reemplazo de los anillos de los pistones

rotor: rotor

rpm: revoluciones por miunto

score: rayado

seal: sello

seat: asiento (de una válvula)

series-circuit: circuito eléctrico en serie en que los aparatos o dispositivos se unen de tal modo que el fallo de uno de ellos causa la interrupción del circuito. Los terminales positivos se conectan a los negativos para formar el circuito.

series-parallel circuit: circuito eléctrico combinado de serie y paralelo

shim: cuña, suplemento de ajuste

short or short circuit: corto, corto circuito

shunt: sunt, derivador de corriente, conexión de dos puntos para formar un circuito paralelo

shunt generator: dinamo excitado en derivación

slip rings: anillos colectores del campo inductor

sludge: sedimento que se forma en el cárter debido a la mescla del aceite con vapores de agua

soldering: soldadura

solenoid: solenoide, bobina electromagnética

solid friction: fricción frotante o rodante

specific gravity: densidad relativa, gravedad específica

spline: chavetero (a la larga de un eje)

stator: estator

step-voltage control: regulación gradual de voltaje

storage battery: batería, acumuladora

strut: poste, puntal, columna

synchronize: sincronizar

tachometer: tacómetro

tapering: conicidad

tappet: empujaválvula, levantaválvula

TC (two-charge) regulator: véase "step voltage control"

AUTOMOTIVE MECHANICS: Technical Terms

MECANICA DE AUTOMOVILES: Terminología Técnica

terminal: terminal

third-brush generator: dinamo de tres escobillas

three phase: trifásico

timing: puesta en punto del encendido

torque: par de torsión

torus: un aparato generador de potencia mediante el empleo del aceite tanto en una unidad propelada como en la propelante

transformer: transformador

transistor: transistor

valve ports: orificio de salida de gases desde las válvulas a los cilindros

venturi - tubo venturi: una restricción en la corriente de aire que produce una reducción en la presión en derredor de la rociadora del combustible de tal manera que la gasolina salga en forma de una neblina fina (el líquido se convierta en neblina)

viscosity: viscosidad

volt - voltio: la norma (o unidad) para la medición de la presión de la corriente en un circuito

voltage - voltaje: el volumen de voltios en un circuito

voltage drop: reducción de voltaje

voltage regulator or voltage limiter: regulador de voltaje o limitador de voltaje

voltmeter: voltímetro

water jacket: chaqueta de agua

winding - devanado: el alambre que forma una bobina, por ejemplo, el devanado del campo inductor, el devanado en serie, etcétera

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y Herramienta

air blow guns: pistolas de aire

air chisel: cortafrío mecánico

air compressor; 5 h.p.: compresor de aire de 5 caballos

air conditioning repair equipment: herramientas y equipo para compostura de aire-acondicionadores

air hoses; 50 ft. length, 1/4 in. inside diameter: manguera de aire, 50 pies de largo, de diámetro interior de 1/4 pulgada

alignment bar: barra alineadora de convergencia

ammeter: amperímetro

arbor press: prensa manual de husillo

automatic transmission bench fixture: dispositivo de banco para compostura de transmisiones automática

automatic transmission gauges: probadora de la transmisión automática con cuadrante y manguera

automatic temperature control testers: probadores automáticos del control de temperatura

automatic transmission tool set: herramienta para compostura de transmisiones automáticas

ball joint checker: probador de articulación (junta) de rótula

battery carrier: portaacumulador

battery charger: dinamo para cargar acumuladores

battery hydrometer: hidrómetro probador de acumulador

battery jumper cables: cables

battery servicer kit: herramiento para conservar la eficiencia de acumuladores

battery storage; 6 volt: acumuladora de seis voltios

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y Herramienta

battery storage; 12 volt: acumuladora de doce voltios

bay lift: elevador (hidráulico)

belt tension gauge: medidor de tensión de correas

bench, work: banco de taller

bolt cutter: cortapernos

boring bar: barra taladradora

brake cylinder; hone: (muela) esmeriladora de cilindros de freno

brake drum lathe: rectificadora de tambores de freno

brake pressure bleeder; diaphram type: purgador de presión de freno, tipo diafragma

brake rivet machine: remachador para frenos o zapatas de freno

brake shoe arc grinder: rectificadora de zapatas de freno

buffing and wire wheel: rueda bruñidora

bushing installer set: herramienta para colocar manguitos

calipers, assorted: calibres o compases

cam bearing installer: instalador de cojinetes del árbol de levas

can, safety gasoline: bidón de seguridad para gasolina

can, water: bidón para agua

carburetor-distributor adjusting tool: herramienta ajustadora de carburadores y distribuidores

carburetor tool kit: herramienta para composturas de carburador

cart, service: carro de servicio

C-clamps, assorted: mordazas o prensas de mano "C", surtidos

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y Herramienta

chain pull: grúa de polea de cadena

chain wrench: llave de cadena

channel locks: alicates ajustables (grandes)

chassis dynamometer: dinamómetro de chasis

cherry picker; a crane: grúa alta

chisel and punch set: juego de cinceles y punzones

coil spring compressor: compresor de muelles espirales

coil spring spreader: separador de muelles espirales

compression gauges: galgas de compresión

connecting rod aligner: alineador de bielas

continuity light: probador de circuitos eléctricos

cooling system chemical tester: higrómetro (probador del refrigerante)

crankshaft grinder: rectificadora de cigüeñal

creeper; flat: tarima rodadiza

creeper, seat, with casters: silla rodadiza

cylinder dial indicator gauge: micrómetro de cuadrante para revisar cilindros (verificar su desgaste)

deglazer: líquido para atacar ligeramente las paredes pulimentadas interiores del cilindro

diagonal cutting pliers: alicates de corte diagonal

dial indicator: indicador de cuadrante

differential holder: banca para sopertar el diferencial

diode tester: probador de diodos

diode tool set: juego de herramienta para la compostura de diodos

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y Herramienta

disc brake lathe: torno rectificador de frenos de disco

distributor tester: probador de distribuidores

distributor wrenches: llaves para composturas del distribuidor

drill bits; assorted: brocas, surtidas

drill press: taladradora radial

drills, air: taladradoras, o barrenadoras, impulsadas por aire

drills, electric; assorted: taladradoras eléctricas, surtidas

drop light or trouble light: lámpara portátil de enchufe

electric arc welder: soldador de arco

electronic ignition tester: probador electrónica del encendido

engine analyzer; complete with scope and emissions tester: analizador de motor, completo con mira y probrador de emisiones

engine oil leak detector: buscafugas del aceite del motor

engine sling; adjustable: cabestrillo ajustable para sacar o levantar el motor

engine stand: portoestante de motores

exhaust pipe expander: ensanchador de tubería de escape

feeler gauges; assorted: galgas

fender covers: tapaguardafangos

files; assorted: limas, surtidas

flaring tool kit: herramientas abocinadoras

flywheel turner: palanca-llave para dar vueltas al volante

fuel pump tester: probador de bombas de combustible

gear and bearing pullers: extractores de engranes y cojinetes

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y Herramienta

generator-alternator test bench: banco para probar dinamos y alternadores

glass bead cleaner: máquina limpiadora a base de glóbulas de vidrio

grinder; bench: esmeriladora de banco

grinding wheel dresser: rectificadora de muelas abrasivas

growler: zumbador para probar aislamientos

hack saws: sierras de arco para metales

hammers, assorted: martillos, surtidos

hand jacks; assorted: gatos de mano, surtidos

head lamp aimer: centrador de luces delanteras (de automóviles)

head lamp intensity meter: intensímetro para checar los faros

head surfacer: rectificador de tapacilindros

hose clamp, pliers: alicates de abrazaderas de manguera

hot tank cleaner: baño caliente de "oakite", una substancia para limpiar las piezas del motor, etcétera. Es un cáustico activo sólo al calentarse.

hydraulic press: prensa hidráulica

hydraulic valve lifter tools: alicates probadores de y máquina probadora de los empujaválvulas hidráulicos

hydrometer float, antifreeze tester: probador de anticongelante

jack stands: soportes o estantes que se substituyen por el gato una vez alzado el coche en el taller

lathe: torno

lifts: alzadores, grúas, elevadores, etcétera

librication equipment: equipo para engrasar

measuring tape: cinta de medir

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y Herramienta

metal marker, electric. marcador eléctrico de metales (lápiz eléctrico)

micrometers; assorted: micrómetros, surtidos

mirrors, inspection: espejos para inspecciones

needle-nosed pliers; assorted: alicates de boca larga, surtido

ohmmeter: ohmímetro

oil drain pans: bandejas para purga de aceite

oil filter wrench: palanca con abrazadera para soltar o apretar el filtro de aceite

oiling cans: aceiteras

oil measure: medida para aceite

parts cleaning tank: baño para limpiar piezas

pipe wrench: llave para tubos

piston expander tool: expansionadora de pistones

piston pin hole hone: muela de rectificar los cojinetes de pasador de pistón

piston pin installing kit: equipo para instalar pasadores de pistón

piston-ring groove cleaner: limpiador de las ranuras de los anillos de pistón

piston-ring remover and installer: saca - e instala

pressure pack flushing gun: pistola purgadora de presión (con aire comprimido y agua)

racks; piston and connecting rod holders: soportes para pistones y bielas

regrooving tool; piston: herramienta para rectificar las ranuras de pistón

ridge reamer: escariador de lomo

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y Herramienta

scratch awl: punta de trazar

screwdriver; clutch head attachments, assorted: desarmador, de cabeza de trinquete y accesorios surtidos

screwdrivers; phillips: desarmadores para tornillos phillips o de estrella

screwdrivers; standard set: desarmadores o desatornilladores de forma

screw thread gauge: galga para hilos de roscas

seal installer set: herramientas para la instalación de los sellos obturadores (posteriores)

seal removers: ganchos para sacar los sellos obturadores para ser repuestos (renovados)

service jacks; assorted: gatos de servicio, surtido

slip joint pliers; assorted: alicates de articulación movible

snap rings plier set: juego de alicates para anillos sujetadores

snap ring truarc; internal/external: anillos sujetadores marca "truarc", internos y externos

snips, tin; assorted: tijeras para chapa o hoja de lata, surtido

soldering iron or gun: cautín o pistola para soldar

spark plug cleaning machine: máquina para limpiar bujías

spring tension: tensión de muelle

stamps, steel; letters and numbers: sellos para numerar y letrar, sellos de números y letras

steam jenny; a high pressure steam or combination cleaner: limpiadora de vapor a alta presión

straight edge: reglón

suction gun: bomba (pistón) succionadora

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y herramienta

tach dwell meters: tacómetros de mano para probar el funcionamiento de los platinos del distribuidor

tap and die set: juego de machos y terrajas para roscar

terminal kit and crimping tool: terminales surtidos y alicates

test lights; high voltage and low voltage: probadores de circuito de alto y bajo voltaje

thermostat tester: probador de termostato

thread chaser: peine para tornillos

tie-rod end remover: extractor de términos de barra de acoplamiento

timing light: estroboscopio de destellos rápidos

tire bead expander: expansionador o separador de cubiertas (llantas)

tire gauges: manómetros

tire service machine: máquina para el montaje y desmontaje de cubiertas (llantas)

tire tube leak detector tank: baño para la detección de fugas de aire

torque converter flusher: purgador del transformador o convertidor de par motor

transmission funnels: embudos para el fluido de transmisión automática

transmission jack: gato o alzador sostén de transmisión

tubing wrenches: llaves para tubería

U-joint press: prensa para cardanes

undercutter: rectificadora del conmutador

utility chain with hooks: grúa de cadenas con ganchos

valve guide replacement tool: punzón de guía de válvula

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y Herramienta

valve guide resizing tool: expansionadora para guías de válvula

valve insert tool: prensa para instalar manguitas de válvulas

valve reconditioning equipment: equipo para la rectificación de válvulas

valve spring compressor: comprimidor de muelles de válvula

valve spring tester: probador de muelles de válvula

vise grip pliers: alicates de agarre de tornillo

vise, machinist's; assorted: tornillos y prensas de banco

volt-amp tester: probador de voltaje y amperaje

voltmeter: voltímetro

welding equipment; oxyacetylene: equipo de soldadura oxiacetilénica

wheel alignment equipment: equipo para alinear ruedas

wheel balancer; bubble: equilibrador de ruedas con indicador de burbguja

wheel balancer; spin-type: equilibrador de ruedas, tipo de movimiento de rotación

wheel balancer; strobe: equilibrador estroboscópico de ruedas

wheel lug wrench; x-type, 4-way: llave de ruedas, tipo de cruz, de cuatro cubos

wheel puller: el sacaruedas

wrench drive adapters: adaptadores de impulsores de llaves

wrenches; adjustable set: juego de llaves ajustables

wrenches; air impact: llaves impulsados por aire compresado

wrenches; Allen: llaves allen (hexagonales)

wrenches; box: llaves de tubo

AUTOMOTIVE MECHANICS: Equipment and Tools

MECANICA DE AUTOMOVILES: Equipo y Herramienta

wrenches, ignition set: llaves para trabajos de encendido

wrenches; open-end and combination box wrench set: estuche de llaves de boca abierta y de cubo en combinación

wrenches; socket set, 1/2 in. drive: juego de llaves de cubo (o de vaso) de entrada de 1/2 pulgada

wrenches; socket set, 3/8 in. drive: juego de llaves de cubo (o de vaso) de entrada de 3/8 pulgada

wrenches; socket set, 3/4 in. drive: juego de llaves de cubo (o de vaso) de entrada de 3/4 pulgada

wrenches; socket set, 1/4 in. drive: juego de llaves de cubo (o de vaso) de entrada de 1/4 pulgada

wrenches; torque, inch/lbs.: llaves de torsión con dinamómetro y cuadrante en pulgadas/libras

wrenches; torque, foot/lbs.: llaves de torsión con dinamómetro y cuadrante en pies/libras

AUTOMOTIVE MECHANICS TECHNICAL TERMS

ENGLISH-LAOTIAN LEXICON

CAREER DEVELOPMENT CENTER
SCHOOL OF TECHNICAL CAREERS
SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE, ILLINOIS

AUTOMOTIVE MECHANICS TECHNICAL TERMS

ENGLISH-LAOTIAN LEXICON

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The preparation of this multicultural series was aided financially through funding agreements with the Illinois State Board of Education/Department of Adult, Vocational and Technical Education.

(Contract Numbers: R-33-10-C-0442-400, R-33-21-J-0542-400)

June 1981

ARDEN L. PRATT, DEAN
E. HOLLIS MERRITT, ASST. DEAN
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AUTOMOTIVE MECHANICS: Technical Terms

AC, ac: ໄຟສລັບ ກະແສໄຟສລັບ.

accessories: ເຄື່ອງປະກອບຣົດ ເຊັ່ນ ເຄື່ອງທຳຄວາມຮ້ອນ, ວິທະຍຸ, ເຄື່ອງປັບອາກາດ.

adapter: ອັນດັດແປງຂອງທີ່ມີຂນາດບໍ່ເທົ່າກັນ.

advance: ໝາຍຄວາມວ່າ ການຈູດໄໝ້ຂອງຈານຈ່າຍ ເກີດຂຶ້ນກ່ອນກຳນົດ.

air gap: ຊ່ອງອາກາດຣະຫວ່າງທອງຂາວ ຊ່ອງຫວ່າງຣະຫວ່າງປາຍຫົວທຽນ

alternator: ໝໍ້ສຳໄຟຂອງເຄື່ອງຍົນ.

ambient temperature: ອຸນຫະພູມຮອບໆເຄື່ອງໄຟຟ້າ ວັດຫ່າງຈາກຕົວປັບໄຟ. (Regulater) ນຶ່ງນິ້ວ ຈາກບ່ອນຫຸ້ມ.

ammeter: ເຄື່ອງມືວັດກະແສໄຟຟ້າ.

amperage: ຈຳນວນຂອງກະແສໄຟ.

amperage draw: ຈຳນວນກະແສທີ່ຕ້ອງໃຊ້ ສຳລັບການເດີນເຄື່ອງໄຟ.

ampere: ໜ່ວຍວັດຂອງກະແສໄຟ (Ampere).

anode: ຫົວບວກ (+) ຂອງວົງຈອນໄຟຟ້າ.

armature: ເຫຼັກອ່ອນພັນລວດໃນເຄື່ອງປັ່ນໄຟ (Generator).

armature coil: ຄື ລວດພັນທີ່ຢູ່ຂ້າງນອກຂອງ Armature.

battery: ໝໍ້ເກັບໄຟ.

bearing: ລູກປືນ.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

block: ທ່ອນເຄື່ອງຈັກທີ່ມີ ເຊື້ອສູບເປັນປະກອບ.

bore: ໝາຍເຖິງ ເສັ້ນຜ່ານສູນກາງຂອງເຊື້ອສູບ.

brush: ກ້ອນຖ່ານສຳລັບ ໝໍ້ປັ່ນໄຟ(Generator) ຫຼືເຄື່ອງຕິດເຄື່ອງຈັກ(Starter

bushing: ປອກໂລຫະ:

calibrate: ແຕ່ງໃຫ້ເປັນສັດສ່ວນ.

cam: ງັ້ນຂອງເຄື່ອງຈັກ ຊຶ່ງທຳໜ້າທີ່ ປິດເປີດລີ້ນສູບ (ວາວ)

camber: ໜ່ວຍວັດສູນລໍ້ໜ້າ ວ່າຈະອ່ຽງເຂົ້າ ຫຼື ອ່ຽງອອກ.

carbon monoxide: (ຄາບອນ ມໍນົອກໄຊ) ກາຊທີ່ເປັນພິດ ເກີດຈາກ ການເຜົາໄໝ້ ຂອງນ້ຳມັນທີ່ບໍ່ໝົດ.

carbon pile: ທີ່ໃຊ້ປະກອບດ້ວຍແຜ່ນຄາບອນ (Carbon) ເພື່ອ ປ່ອຍແຮງກະແສໄຟ ໃຊ້ຢູ່ໃນເຄື່ອງປັບກະແສໄຟ ສາກາຈຸມິດ.

carburetor: ສ່ວນປະກອບເຄື່ອງຈັກທີ່ທຳໜ້າທີ່ ປະສົມນ້ຳມັນ(Gasoline ກັບອາກາດໃຫ້ຖືກສ່ວນ.

car stand: ຂາຕັ້ງຣົດໃຫ້ຢູ່ກັບທີ່.

caster: ການວັດແທກຊ່ວງລໍ້ໜ້າ ຫຼືເພົາຂອງລໍ້ ວ່າອ່ຽງທາງປາຍໃດ.

cathode: ຂົ້ວລົບ (-) ຂອງວົງຈອນກະແສໄຟ.

charge or recharge: ຕື່ມໄຟໃຫ້ໝໍ້ໄຟ.

charging rate: ການຕັ້ງຄວາມໄວ ສຳລັບໝໍ້ໄຟ.

chassis: ພື້ນຕົວຖັງຂອງຣົດ.

chock: ໝອນ ຫຼື ທ່ອນໄມ້ ສຳລັບ ເຮັດໃຫ້ ລົດ ຢູ່ ກັບທີ່.

circuit: ວົງຈອນກະແສໄຟຟ້າ.

circuit breaker: ເຄື່ອງມືທີ່ຕັດກະແສໄຟຟ້າອອກ ເພື່ອປ້ອງກັນໄຟ
ໄໝ້.

clearance: ຊ່ອງຫວ່າງ ລະຫວ່າງ ສິ່ງຂອງ ສອງອັນ.

combustion: ການເຜົາໄໝ້ໃນເຄື່ອງຈັກ.

commutator: ເຄື່ອງມືທີ່ໃຊ້ສຳລັບ ປ່ຽນທິດທາງຂອງກະແສໄຟ.

compression: ຄວາມກົດດັນຂອງອາກາດ ເຮັດໃຫ້ປະລິມາດ ຫຍໍ້ນ້ອຍລົງ

condense: ປ່ຽນ ລະອອງໄອ ອາກາດໃຫ້ ເປັນຂອງແຫຼວ.

condenser: ເຄື່ອງໃຫ້ກະແສໄຟຟ້າ.

conductor: ສິ່ງທີ່ເຮັດໃຫ້ໄຟຟ້າແລ່ນຜ່ານໄດ້.

connecting rod: ກ້ານສູບທີ່ໃຊ້ຕິດຕໍ່ລູກສູບກັບຂໍ້ວ່ຽງ (Craink shaft)

connector: ສິ່ງທີ່ເຮັດໜ້າທີ່ຕໍ່ວົງຈອນກະແສໄຟເຂົ້າຫາກັນ.

current: ກະແສໄຟວັດເປັນໜ່ວຍແອມແປ (Amperes)

current limiter: ເຄື່ອງທີ່ເຮັດໜ້າທີ່ຈຳກັດກະແສໄຟ.

cutout relay: ເຄື່ອງທີ່ສຳລັບປິດເປີດ ວົງຈອນກະແສໄຟ ລະຫວ່າງໝໍ້
ຈ່າຍໄຟ ກັບໝໍ້ໄຟ.

cycle: ເປັນຮອບໆ ສະໝໍ່າສະເໝີ.

dapener: ໜ່ວຍທີ່ໃຊ້ທັງໜ້າຂອງ Crankshaft ສຳລັບລົດການສັ່ນສະເທືອນ.

DC, dc: ກະແສໄຟຕົງ.

de-line engine: ເຄື່ອງຈັກທີ່ເສື້ອສູບຕັ້ງເປັນແຖວຊື່.

dielectric: ເຄື່ອງທີ່ໄຟຟ້າແລ່ນຜ່ານບໍ່ໄດ້ (ສະໜວນ).

diode or diode rectifier: ສິ່ງທີ່ໃຊ້ປ່ຽນກະແສໄຟສະລັບໃຫ້ເປັນກະແສໄຟຕົງ.

direction of current flow: ທາງເດີນຂອງກະແສໄຟຈາກລົບ (–) ໄປຫາບວກ (+).

distortion: ປ່ຽນແປງຮູບ.

drilling: ເຈາະດ້ວຍສະ ວ່ານ.

eccentric: ບໍ່ຢູ່ໃນສູນກາງ.

electrolyte: ນ້ຳກົດຂອງໝໍ້ເກັບໄຟ.

engine: ເຄື່ອງຈັກ.

engine drag: ການຊືດສືຂອງຊິ້ນປະກອບທີ່ຕິດກັບເຄື່ອງຈັກ.

exhaust: ທໍ່ໄອເສັຽຈາກເຄື່ອງຈັກໄປຫາທໍ່ເກັບສຽງ.

expander: ເຄື່ອງມືຂອງນາຍຊ່າງ ສຳລັບຂຍາຍແຫວນສະປິງ.

field: ທົ່ງແມ່ເຫຼັກ

field coil: ສ່ວນທີ່ພັນດ້ວຍເສັ້ນສາຍໄຟ ທຳໃຫ້ທົ່ງແມ່ເຫຼັກ ເພື່ອໃຫ້ກະແສໄຟແລ່ນໄດ້.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

fins: ຊີ່ທີ່ຍື່ນອອກມາ ເພື່ອລະບາຍຄວາມຮ້ອນ ຈາກເຄື່ອງຈັກ.

fluid friction: ຄວາມເສີຽດຂອງຂອງແຫຼວ

frame: ເຮືອນລົດ.

friction: ແຮງເສັຽດໃຫ້ຊ້າລົງ.

fuse: ເຄື່ອງມືໄວ້ປ້ອງກັນກະແສໄຟ ທີ່ຫຼາຍເກີນຄວນ.

galling: ລັກສະນະຂອງເຫຼັກທີ່ຂູດຫຼືຖູກັນ ໂດຍບໍ່ມີນ້ຳມັນຫຼໍ່ລື່ນ
ເຮັດໃຫ້ເຄື່ອງຈັກ ຍຸດຊະງັກ.

gasket: ໂປເກັນຂອງເຄື່ອງຈັກ ລະຫວ່າງຂໍ່ງຂອງຂອງອັນ.

gassing: ອາກາດເປັນພິດທີ່ອອກມາຈາກນ້ຳກົດຂອງໝໍ້ໄຟໃນລະ
ຫວ່າງຕື່ມໄຟລົງໃນໝໍ້ໄຟ (ບັນຈຸໄຟຟ້າ).

generator: ໝໍ້ປັ່ນໄຟ.

gravity: ຄວາມໜັກຂອງສິ່ງຂອງ.

grinding: ການຝົນ.

ground: ສາຍດິນຂອງລົດ ໂດຍໃຊ້ເຮືອນລົດ ເປັນທາງເດີນໄຟຟ້າ.

growler: ເຄື່ອງກວດສອບ Armature ອັນທີ່ໝູນໄດ້ໃນໝໍ້ປັ່ນໄຟ

heat sink: ຊີ່ທີ່ເຮັດໃຫ້ຄວາມຮ້ອນລະບາຍໄດ້ງ່າຍ ໂດຍໃຊ້ສານພິ
ເສດ ຫຼືລົບພາຄວາມຮ້ອນອອກໄປ.

hone: ຝົນ ໂດຍໃຊ້ຫີນທີ່ລະອຽດທີ່ສຸດ.

housing: ບ່ອນຫຸ້ມເຄື່ອງຈັກ ຫຼືເຄື່ອງຈັກຕິດຕັ້ງຢູ່ຂ້າງໃນ.

hydrometer: ເຄື່ອງວັດນ້ຳກົດຂອງໝໍ້ໄຟ.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

hypoid: ເຟືອງເກັງ ຂອງ ເພົາຣົດ.

I.D.: ເສັ້ນ ຜ່ານ ສູນ ກາງ ທີ່ວັດແທກ ຂ້າງໃນ ຂອງ ວົງກົມ.

impulse: ແຮງດຶງໃນ ຣະຫວ່າງແຮງເຄື່ອງ ໂດຍເຄື່ອງໝູນເຄື່ອງຈັກ. (Starter).

insulator: ສິ່ງທີ່ ນຳໄຟຟ້າບໍ່ໄດ້ (ສະໜວນ).

internal combustion engine: ເຄື່ອງຈັກທີ່ມີການເຜົາໄໝ້ຢູ່ທາງໃນເຄື່ອງຈັກ.

jet: ຮູນ້ອຍໆ ສຳລັບ ປ່ອຍນ້ຳ ມັນເຂົ້າ-ອອກ ຈາກ ຄາບິວແຣເຕີ.

key: ຕົວໝອນສຽບເຫຼັ່ມ ເຄິ່ງດວງຈັນ ສຳລັບ ຍຶດ ຕົວ ລູກລໍ້ໃຫ້ຢູ່ ຕິດກັບ ກ້ານຂອງລໍ້ວຽງ.

light-load test: ການທົດລອງ ໂດຍ ການເປີດໄຟ ບໍ່ຫຼາຍ ເພື່ອທົດສອບ ໝໍ້ໄຟວ່າ ມັນເກັບໄຟໄດ້ດີຫຼືບໍ່.

linkage: ຂໍ້ຕໍ່.

lock washer: ແຫວນເພື່ອຍຶດຕົວນ໊ອດໄວ້ ຫຼື ສະກຣູໄວ້ໃຫ້ແໜ້ນ.

machining: ການກຶງເຫຼັກໂດຍໃຊ້ເຄື່ອງກຶງ.

magnetic switch: ບ່ອນປິດເປີດກະແສໄຟ ໂດຍໃຊ້ແມ່ເຫຼັກເປັນ ອັນປິດ.

mica: ຕົວກັນໄຟ (ສະໜວນ) ໃຊ້ໃນ ທໍ່ໝູນເຄື່ອງຈັກ ແລະ ໝໍ້ປັ່ນ ເຄື່ອງ.

micrometer: ເຄື່ອງມືທີ່ວັດແທກຢ່າງລະອຽດ ນ້ອຍເຖິງ .001 ນິ້ວ.

mike: ຄຳຫຍໍ້ ສຳລັບ Micrometer.

milling: ການກຶງໂດຍໃຊ້ເຄື່ອງກຶງ ທີ່ມີໃບມີດຕັດເຫຼັກໝູນຮອບຕົວ.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

motor: ໝໍ້ເຄື່ອງທີ່ໃຊ້ປັ່ນເຄື່ອງອື່ນໆ.

negative: ຂົ້ວລົບ (-) ຂອງໄຟຟ້າ.

nonconductor: ເບິ່ງຄຳວ່າ "Insulator" (ສິ່ງບໍ່ນຳກະແສໄຟຟ້າ).

ohm: ໜ່ວຍວັດກະແສໄຟຟ້າ.

ohmmeter: ເຄື່ອງວັດຄ່າພວມກະແສໄຟຟ້າ.

open circuit: ວົງຈອນໄຟຟ້າປິດ (ເພາະມີໂອບບ່ຽງອື່ນ ຫຼື ສາຍໄຟລຸດ)

overcharging: ສົ່ນໄຟໃນໝໍ້ໄຟເກີນໄປ.

parallel circuit: ການຕໍ່ສາຍໄຟໃນວົງຈອນ ຢ່າງຂະໜານ ຄື ຂົ້ວບວກ (+) ກັບຂົ້ວບວກ ແລະ ຂົ້ວລົບ (-) ກັບຂົ້ວລົບ.

parts common: ເຄື່ອງອາໄຫລ່ຂອງຣົດທຸກຊະນິດ.

plate: ການເຄືອບໂລຫະ:

polarizing generator: ການຕໍ່ສາຍໄຟ ຕອບຂົ້ວບວກແລະຂົ້ວລົບໃຫ້ຖືກ ທາງ ຊ້ຳທີ່ເບືອດ: ເພື່ອໃຫ້ອັນຕວນຄູນໃໝ່.

positive: ຂົ້ວບວກຂອງໝໍ້ໄຟ ຫຼື ກະແສໄຟຟ້າ.

primary circuit: ວົງຈອນອັນທຳອິດທີ່ຈ່າຍກະແສໄຟໃນລະບົບໄຟ ອັນທຳອິດຂອງຣົດ.

punch: ເຄື່ອງມືຂອງນາຍຊ່າງ ສຳລັບຕອກ.

quick charger: ເຄື່ອງສົ່ນໄຟທີ່ໃຊ້ເວລາລະຍະສັ້ນ ໂດຍໃຊ້ກະແສ ໄຟຫຼາຍ ເວລາສົ່ນໄຟ.

reaming: ການຂະຫຍາຍຮູໃຫ້ກວ້າງອອກນ້ອຍນຶ່ງ.

reciprocating action: ການເຄື່ອນທີ່ກັບໄປກັບມາ ເຊັ່ນການເຄື່ອນທີ່ຂອງລູກສູບ.

recirculating ball worm and nut: ແບບຂອງຄະນັບພວງມາໄລຂອງລົດ ໂດຍໃຊ້ລູກປືນທຳໜ້າທີ່ໝູນແລະເຄື່ອນທີ່ໄປຕາມຮ່ອງຂອງເກຼັຽວ.

rectifier: ຕົວປ່ຽນກະແສສລັບ ໃຫ້ເປັນກະແສຕົງ.

regulator: ຕົວຄວບຄຸມຈຳນວນໂວນ (Volt) ແລະກະແສໄຟ (Ampere).

relay: ເຄື່ອງມືໃຊ້ປິດເປີດວົງຈອນໄຟຟ້າ ໂດຍໃຊ້ແມ່ເຫຼັກ.

resistance: ສິ່ງທີ່ໃຊ້ລົດຈຳນວນກຳລັງໄຟ (Volt) ໃຫ້ນ້ອຍລົງ.
(ຄວາມໝາຍຂໍ້ນີ້ແມ່ນຂອງຂໍ້ຕໍ່ໄປ "Resistor")

resistor: ຄວາມຕ້ານທານຂອງກະແສໄຟຟ້າ (ຄວາມໝາຍຂອງ Resistance

rheostat: ເຄື່ອງມືສຳລັບປ່ຽນຈຳນວນຂອງກະແສໄຟຟ້າ.

ring job: ການໃສ່ແຫວນສປຣິງຂອງລູກສູບໃໝ່.

rotor: ຕົວທີ່ໝູນຮອບໆ ທາງໃນຂອງຈານຈ່າຍໄຟຂອງເຄື່ອງຈັກໄປຫາຫົວທຽນຕື່ມ.

rpm: ຮອບຕໍ່ນາທີ.

score: ຮອຍຂູດ ສ່ວນຫຼາຍເກີດຈາກຂອງແຫຼມເປັນເສັ້ນຫຼືຮ່ອງ.

seat: ສ່ວນນັ່ງຂອງລິ້ນສູບ (Valve) ທີ່ປິດອາກາດບໍ່ໃຫ້ຮົ່ວ.

seal: ສ່ວນຂອງເຄື່ອງຈັກທີ່ກັນບໍ່ໃຫ້ນ້ຳມັນຮົ່ວໄຫຼ.

series-circuit: ການຕໍ່ວົງຈອນໄຟຟ້າ ໂດຍຕໍ່ລຽງກັນ ຄືຂົ້ວບວກຕໍ່ກັບຂົ້ວລົບ ແລະລົບຕໍ່ກັບຂົ້ວບວກ ຢ່າງນີ້ສເມີ.

series-parallel circuit: ການຕໍ່ວົງຈອນໄຟຟ້າ ແບບປະສົມ ໂດຍໃຊ້ແບບລຽງແຖວ ແລະແບບຂນານ.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

shim: ແຫວນແຜ່ນບາງໆ ໃຊ້ສໍາລັບທໍາໃຫ້ ສິ່ງຂອງ ມີລະຍະຫ່າງຈາກກັນ ເທົ່າກັນ.

short or short circuit: ວົງຈອນໄຟຟ້າເກີດຊອດ.

shunt: ການຕໍ່ວົງຈອນໄຟຟ້າຂອງຈຸດສອງຈຸດແບບຂະໜານ.

shunt generator: ໝໍ້ປັ່ນໄຟຟ້າທີ່ພັນສາຍໄຟຂະໜານກັບຕົວໝູນຂອງໝໍ້ໄຟ

slip rings: ວົງແຫວນສອງອັນຢູ່ໃນ Armature.

sludge: ສ່ວນທີ່ເປັນສີດໍາຢູ່ໃນນໍ້າມັນເໝືອນຂີ້ຕົມ ເກີດຈາກນໍ້າ ປະສົມນໍ້າມັນເຄື່ອງ.

soldering: ການເຊື່ອມໂລຫະ ໂດຍໃຊ້ ຄວາມຮ້ອນ ກັບກະທົ່ວ.

solenoid: ຕົວຊຸກດັນ ໂດຍໃຊ້ກໍາລັງແມ່ເຫຼັກ ຈາກກະແສໄຟຟ້າ.

solid friction: ແຮງຖ່ວງ ເກີດຈາກການສຽດສີໃນການເຄື່ອນທີ່.

specific gravity: ສັດສ່ວນຂອງນໍ້າໜັກປຽບທຽບກັບປະລິມາດຂອງມັນເອງ.

spline: ບ່ອນວ່າງສໍາລັບໃສ່ສິ່ງຢ່າງອື່ນ ເປັນບ່ອນຮຽງກັນ.

stator: - ສໍາລັບກະປາເຫຼັກອັດໂນມັດ ເປັນສິ່ງຂອງຢູ່ທັງໃນຂອງກະປາເຫຼັກ
- ສໍາລັບໝໍ້ປັ່ນໄຟ ຄືສ່ວນທີ່ຢູ່ກັບທີ່ ຊຶ່ງອັນທີ່ໝູນໄດ້ຢູ່ທາງໃນ.

step-voltage control: ເຄື່ອງປັບແຮງໄຟ (Volt) ໃຫ້ຕໍ່າຫຼືສູງ.

storage battery: ໝໍ້ເກັບໄຟ.

strut: ເຄື່ອງວັດແຫຼກສໍາລັບຕັ້ງສູນ.

synchronize: ເຮັດໃຫ້ຂອງສອງໆຢ່າງເຂົ້າກັນໄດ້.

AUTOMOTIVE MECHANICS: Technical Terms - (cont.)

tachometer: ເຄື່ອງວັດຮອບເຄື່ອງຈັກທີ່ມາເທີ.

tapering: ວົງກົມຂອງເຊື້ອສູບ ວັດໂດຍໃຊ້ເສັ້ນຜ່າສູນກາງຂອງວົງກົມ ທັງເທິງ ແລະ ວົງກົມທັງລຸ່ມ ວ່າແຕກຕ່າງກັນເທົ່າໃດ.

tappet: ສ່ວນທີ່ຢູ່ກັບແຄມຊາບ (Camshaft) ຕໍ່ຈາກ (push rod)

TC (two-charge) regulator: ເບິ່ງ " step-voltage control."

terminal: ຫົວສໍາລັບຕໍ່ສາຍໄຟຈາກຫົວອື່ນ.

third-brush generator: ຫຼັກທີ່ສາມຢູ່ໃນໝໍ້ປັ່ນໄຟ ສໍາລັບຄວບຄຸມກະແສໄຟຟ້າ.

three phase: ຄໍານີ້ໃຊ້ສະເພາະວ່າ ໝໍ້ໄຟບາງອັນມີສາມຫົວ.

timing: ການຕັ້ງໄຟທີ່ທອງຂາວ ແລະ ຈານຈ່າຍໄຟ ເພື່ອເຮັດໃຫ້ເຄື່ອງຈັກແລ່ນໄດ້ດີ.

torque: ແຮງເກີດຈາກແຮງວຽນ.

torus: ລະບົບສົ່ງກໍາລັງຂອງເຄື່ອງຈັກ ໂດຍໃຊ້ນໍ້າມັນເຄື່ອງ ເປັນຕົວຊ່ວຍ

transformer: ໝໍ້ແປງໄຟ ຈາກສູງເປັນຕໍ່າ ແລະ ຈາກຕໍ່າເປັນສູງ.

transistor: ເຄື່ອງມືໃຊ້ເພີ່ມກໍາລັງໄຟຟ້າ (volt).

valve ports: ທາງເຂົ້າຂອງອາກາດປະສົມກັບນໍ້າມັນ ເພື່ອໄປຫາເຊື້ອສູບ.

venturi: ສ່ວນ ທີ່ເຮັດໃຫ້ເກີດສູນຍາກາດ ທັງໃນຄາບິວເຣເຕີ (Carburator) ເພື່ອເຮັດໃຫ້ນໍ້າມັນ ແຕກກະຈາຍເປັນລະອອງນ້ອຍ

viscosity: ຄວາມໜຽວຂອງນໍ້າມັນ ຫຼື ຂອງແຫຼວ.

volt: ກໍາລັງໄຟ.

voltage: ໜ່ວຍກຳລັງໄຟ ວັດເຍັມຈຳນວນກຳລັງໄຟ (Volt).

voltage drop: ກຳລັງໄຟ ລົດລົງ.

voltage regulator or voltage limiter: ເຄື່ອງມື ຢັບ (ຈຳກັດ) ກຳລັງໄຟ (Volt).

voltmeter: ເຄື່ອງວັດກຳລັງໄຟ (Volt).

water jacket: ບ່ອນທີ່ ຮອບ ໆ ເສື້ອສູບ ແລະ ລົ້ນສູບ ສຳລັບໃຫ້ນ້ຳ ແລ່ນຜ່ານໄປ ເຮັດໃຫ້ເຄື່ອງຈັກເຢັນ.

winding: ການມັດສາຍໄຟ ຮອບຕົວເອງ ມີຫຼາຍແລວ.

AUTOMOTIVE MECHANICS: Equipment and Tools

1. air blow guns: ພັດລົມສໍາລັບເປົ່າ.

2. air chisel: ເຄື່ອງມືເຈາະ ຫຼື ຕັດເຫຼັກໂດຍໃຊ້ແຮງດັນຂອງລົມ.

3. air compressor: 5 h.p. ເຄື່ອງອັດລົມຕັບໃນທັບ : 5 ແຮງມ້າ

4. air conditioning repair equipment: ເຄື່ອງມືແປງ ເຄື່ອງທໍາຄວາມເຢັນ

5. air hoses: 50 ft. length, 1/4 in. inside diameter ສາຍລົມຈາກ ຫົວອັດລົມ ປະມານ 50 ຟຸດ ມີເສັ້ນຜ່າສູນກາງ 1/4 ນິ້ວ.

6. alignment bar: ໄມ້ຕັ້ງສູນ.

7. ammeter: ເຄື່ອງວັດກະແສໄຟຟ້າ ມີ ໜ່ວຍເປັນແອມແປ (Amperes)

8. arbor press: ເຄື່ອງອັດໂດຍໃຊ້ກໍາລັງຈາກລະບົບ Hydraulic.
ເບິ່ງ Hydraulic press

9. automatic transmission bench fixture: ທີ່ຈັບກະປຸກເກັຍ ເວລາເອົາອອກມາແປງ.

10. automatic transmission gauges: ເຄື່ອງມືວັດກະປຸກເກັຍອັດຕະໂນມັດ.

11. automatic temperature control testers: ເຄື່ອງມືວັດອຸນຫະພູມໂດຍອັດຕະໂນມັດ.

12. automatic transmission tool set: ເຄື່ອງມືແປງກະປຸກເກັຍອັດຕະໂນມັດ

13. ball joint checker: ເຄື່ອງກວດຄຸນສະພາບຂອງລູກໝາກ (Ball Joint ຂອງລໍ້ໜ້າ.

14. battery carrier: ບອນຫິ້ວໝໍ້ໄຟ.

15. battery charger: ເຄື່ອງຕື່ມໄຟໃຫ້ໝໍ້ໄຟ.

16. battery hydrometer: ເຄື່ອງວັດນໍ້າກົດຂອງໝໍ້ໄຟ.

17. battery jumper cables: ສາຍໄຟໃຊ້ສຳລັບຕໍ່ໝໍ້ໄຟຈາກຣົດຄັນອື່ນ.

18. battery servicer kit: ຊຸດບໍຣິການຂອງໝໍ້ເກັບໄຟ.

19. battery storage: 6 volt ໝໍ້ເກັບໄຟ ຊະນິດ 6 Volt.

20. battery storage: 12 volt ໝໍ້ເກັບໄຟ ຊະນິດ 12 Volt.

21. bay lift: ບ່ອນຍົກຣົດຂຶ້ນ ສຳລັບບໍຣິການ.

22. belt tension gauge: ເຄື່ອງວັດຄວາມຕຶງຂອງສາຍພານ.

23. bench, work: ໂຕ໊ະ ສຳລັບທຳງານ.

24. bolt cutter: ເຄື່ອງມືໃຊ້ຕັດ.

25. boring bar: ແທ່ງເຫຼັກໃຊ້ຄ້ວານເຈືອ ສູບ ຫຼື ຮູ ກົມໆ

26. brake cylinder: hone ຝົນໃຫ້ເນື້ອຂອງຮູ ວົງກົມ ສະໝ່ຳສະເໝີ.

27. brake drum lathe: ເຄື່ອງກຶງດຸມຂອງຫ້າມລໍ້ (Brake).

28. brake pressure bleeder: diaphram type ເຄື່ອງໄລ່ລົມ.

29. brake rivet machine: ເຄື່ອງຕອກກາມຸດຂອງຫົວຫ້າມລໍ້.

30. brake shoe arc grinder: ບ່ອນຝົນຫົວຫ້າມລໍ້.

31. buffing and wire wheel: ບ່ອນຝົນ ໂດຍໃຊ້ລໍ້ທີ່ທຳດ້ວຍເສັ້ນລວດ.

32. bushing installer set: ເຄື່ອງມືເປັນຊຸດ ສຳລັບໃສ່.

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

33. **calipers**: assorted ປາກກາແຂງໃຊ້ສຳລັບວັດເສັ້ນຜ່າສູນກາງ.

34. **cam bearing installer**: ລູກປືນຂອງລູກກະບີ້ງ.

35. **can**: safety, gasoline ຖັງນ້ຳມັນ (ເບັນຊິນ).

36. **can**: water ຖັງນ້ຳ

37. **carburetor-distributor adjusting tool**: ເຄື່ອງມືສຳລັບຕັ້ງຈານຈ່າຍ (bisthibutor) ແລະຕັ້ງ Carburetor.

38. **carburetor tool kit**: ເຄື່ອງມືສຳລັບຄາບິວເຣເຕີ.

39. **cart**: service ໂຕະທີ່ມີລໍ້ເລື່ອນໄດ້.

40. **C-clamps**: assorted ອັນຈັບທີ່ມີຮູບຮ່າງເໝືອນຕົວຊີ (C).

41. **chain fall**: ສາຍໂສ້.

42. **chain wrench**: ກະແຈທີ່ມີສາຍໂສ້ຕິດ.

43. **channel locks**: ຄີມປາກຍາວ ສຳລັບຈັບຢ່າງແໜ້ນ.

44. **chassis dynamometer**: ບ່ອນຕັ້ງເຄື່ອງຈັກ ສຳລັບວັດກຳລັງເຄື່ອງ.

45. **cherry picker**: a crane ເຄື່ອງຍົກເຄື່ອງຈັກອອກຈາກເຮືອນຣົດ.

46. **chisel and punch set**: ສລັດ ແລະ ສິ່ວ ເປັນຊຸດ

47. **coil spring compressor**: ເຄື່ອງກົດຕົວສະປຣິງ.

48. **coil spring spreader**: ເຄື່ອງຂະຫຍາຍສະປຣິງ.

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

49. compression gauges: ເຄື່ອງວັດຄວາມກົດດັນຂອງລູກສູບ.

50. connecting rod aligner: ເຄື່ອງວັດຄວາມທ່ຽງຂອງກ້ານສູບ.

51. continuity light: ຫລອດໄຟທົດລອງກະແສໄຟ.

52. cooling system chemical tester: ເຄື່ອງທົດສອບລະບົບລະບາຍຄວາມຮ້ອນຂອງເຄື່ອງຈັກ.

53. crankshaft grinder: ເຄື່ອງຝົນເພົາຂໍ້ຂ່ຽງ.

54. creeper; flat: ຂອງຮອງສໍາລັບນອນ ໃນຂະນະແປງຣົດ.

55. creeper, seat: with casters ບ່ອນນັ່ງສໍາຣັບແປງຣົດທີ່ມີລໍ້ເລື່ອນ.

56. cylinder dial indicator gauge: ເຄື່ອງວັດຄວາມທັຍຂອງເສື້ອສູບ.

57. deglazer: ເຄື່ອງຝົນໃຫ້ເສື້ອສູບສະອາດ.

58. diagonal cutting pliers: ຄີມຕັດລວດ.

59. dial indicator: ເຄື່ອງວັດເຂັມ.

60. differential holder: ບ່ອນຈັບເພົາຫຼັງຂອງຣົດ.

61. diode tester: ເຄື່ອງກວດສອບ. DIODE.

62. diode tool set: ຊຸດເຄື່ອງກວດສອບ DIODE.

63. disc brake lathe: ເຄື່ອງກຶງຈານຫ້າມລໍ້.

64. distributor tester: ເຄື່ອງທົດສອບຈານຈ່າຍ.

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

65. distributor wrenches: ກະແຈມື ສໍາລັບຈານຈ່າຍ.

66. drill bits: assorted ດອກສວ່ານ.

67. drill press: ເຄື່ອງສວ່ານຕັ້ງບົນແທ່ນເຫຼັກ.

68. drills, air: ສວ່ານທີ່ໃຊ້ສໍາລັບ

69. drills, electric: assorted ສວ່ານໄຟຟ້າ.

70. drop light or trouble light: ໄຟສ່ອງ.

71. electric arc welder: ເຄື່ອງເຊື່ອມແບບໄຟຟ້າ.

72. electronic ignition tester: ເຄື່ອງກວດສອບລະບົບຈານຈ່າຍແບບ ລະບົບ [illegible] ໃຊ້ອີເລດຕຣອນ (Electronic)

73. engine analyzer: complete with scope and emissions tester ເຄື່ອງວິເຄາະເຄື່ອງຈັກ ທີ່ມີຮູບໜ້າປັດ ແລະເຄື່ອງກວດສອບໄອເສຍ.

74. engine oil leak detector: ເຄື່ອງກວດວ່ານໍ້າມັນເຄື່ອງຮົ່ວຫຼືບໍ່.

75. engine sling: adjustable ສາຍດຶງເຄື່ອງຈັກ.

76. engine stand: ບ່ອນຂຍາຍທໍ່ອາກາດເສຍ (ຄວາມໝາຍຂໍ້ 77)

77. exhaust pipe expander: ບ່ອນຕັ້ງເຄື່ອງຈັກ (ຄວາມໝາຍຂໍ້ 76).

78. feeler gauges: assorted ທີ່ວັດແທກຄວາມໜາແບບລະອຽດ.

79. fender covers: ບ່ອນກັ້ນບັງໂຄນ.

80. files: assorted ຕະໄບ.

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

81. flaring tool kit: ເຄື່ອງຂຍາຍໃຫ້ທໍ່ເຫຼັກບານປາຍ

82. flywheel turner: ເຄື່ອງຫຶງ Flywheel.

83. fuel pump tester: ເຄື່ອງມືສອບກວດສູບ (ປັ໊ມ) ນ້ຳມັນ.

84. gear and bearing pullers: ເຄື່ອງມືດຶງເຟືອງ ແລະ ລູກປືນ.

85. generator-alternator test bench: ໂຕ໊ະສຳລັບກວດໝໍ້ປັ່ນໄຟຟ້າຂອງຣົດ.

86. glass bead cleaner: ເຄື່ອງລ້າງເຄື່ອງອະໄຫຼ່ຂອງຈັກ ໂດຍໃຊ້ ເມັດຊາຍນ້ອຍໆເປົ່າຢ່າງແຮງ.

87. grinder: bench ເຄື່ອງຝົນມີດຕິດກັບໂຕ໊ະ.

88. grinding wheel dresser: ວົງລໍ້ທີ່ມີເຂັມລວດຕິດສຳລັບທຳຄວາມສະອາດ ຫີນເຈັຍ. ຂີ້ໝ້ຽງອອກ.

89. growler: ຈັງ ສຳລັບໃສ່ໝໍ້.

90. hack saws: ເລື່ອຍຕັດເຫຼັກ.

91. hammers: assorted ຄ້ອນຕີ.

92. hand jacks: assorted ເຄື່ອງຍົກຣົດຊະນິດໃຊ້ມື.

93. head lamp aimer: ບ່ອນເລັ່ງຂອງຕາໄຟຂອງຣົດ.

94. head lamp intensity meter: ເຄື່ອງວັດຄວາມສ່ວາງຂອງຕາໄຟ.

95. head surfacer: ບ່ອນເຈັຍໃຫ້ໜ້າສູບພຽງ.

96. hose clamp: pliers ບ່ອນຈັບສາຍຢາງທໍ່ນ້ຳ ເຮັດດ້ວຍເຫຼັກ.

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

97. hot tank cleaner: ການລ້າງເຄື່ອງໂດຍໃຊ້ຄວາມຮ້ອນຂອງນ້ຳ.

98. hydraulic press: ເຄື່ອງອັດ ໂດຍໃຊ້ກຳລັງງານຂອງເຫລວ ເຊັ່ນ ນ້ຳມັນ.

99. hydraulic valve lifter tools: ເຄື່ອງມືຖອດຍົກລີ້ນຫຼຸບ (Valve lifts) ທີ່ມີລະບົບໄຮດຣໍລິກ (Hydraulic)ຢູ່ ຈຶ່ງຍົກ.

100. hydrometer float: antifreeze tester ເຄື່ອງວັດນ້ຳກົດ.

101. jack stands: ບ່ອນຕັ້ງລົດໃຫ້ຢູ່ກັບທີ່ ເວລາແປງ.

102. lathe: ເຄື່ອງກຶງ.

103. lifts: ຍົກໃຫ້ສູງຂຶ້ນ.

104. lubrication equipment: ເຄື່ອງອັດຈາລະບີ ນ້ຳມັນຫຼໍ່ລື່ນອື່ນໆ.

105. measuring tape: ເຊືອດແທກລະຍະ.

106. metal marker, electric: ເຄື່ອງແກະສລັກໂດຍໃຊ້ໄຟຟ້າ.

107. micrometers: assorted ເຄື່ອງວັດຢ່າງລະອຽດຫຼາຍຢ່າງ.

108. mirrors, inspection ແວ່ນເບິ່ງຂ້າງຫຼັງ.

109. needle-nosed pliers: assorted ຄີມປາກຍາວ (ມີຫລາຍຂະໜາດ)

110. ohmmeter: ເຄື່ອງວັດກະແສໄຟຟ້າ.

111. oil drain pans: ອັນຮັບນ້ຳມັນເຄື່ອງ ໃນເວລາ ປ່ຽນນ້ຳມັນເຄື່ອງ.

112. oil filter wrench: ກະແຈມື ສຳລັບຂັນຕອງນ້ຳມັນ

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

113. oiling cans: ກະປ໋ອງນ້ຳມັນເຄື່ອງ.

114. oil measure: ອັນວັດແທກນ້ຳມັນເຄື່ອງ.

115. parts cleaning tank: ຖັງລ້າງເຄື່ອງອະໄຫຼ່.

116. pipe wrench: ກະແຈຄັນທໍ່ເຫຼັກ.

117. piston expander tool: ເຄື່ອງຂຍາຍແຫວນສະປິງ.

118. piston pin hole hone: ການຝົນຮູ ຂອງລູກສູບ.

119. piston pin installing kit: ຊຸດເຄື່ອງມືສຳລັບໃສ່ສລັກຂອງລູກສູບ.

120. piston-ring groove cleaner: ເຄື່ອງມືທຳຄວາມສະອາດຮ່ອງຂອງແຫວນລູກສູບ.

121. piston-ring remover and installer: ເຄື່ອງເອົາແຫວນໃສ່ລູກສູບ ແລະ ເອົາອອກດ້ວຍ.

122. pressure pack flushing gun: ເຄື່ອງລ້າງໝໍ້ນ້ຳດ້ວຍກຳລັງດັນຂອງນ້ຳ.

123. racks: piston and connecting rod holders ບ່ອນວາງລູກສູບແລະກ້ານສູບ

124. regrooving tool, piston: ເຄື່ອງທຳຄວາມສະອາດຮ່ອງຂອງແຫວນສປິງ

125. ridge reamer: ເຄື່ອງຕັດຂອບທີ່ຍື່ນອອກມາ ຂອງເສື້ອສູບຂ້າງເທິງ.

126. scratch awl: ເຫຼັກຈື້ມ

127. screwdriver: clutch head attachments, assorted ໄຂຄວງແບບພິເສດ ມີຫົວເປັນຮູບ 8

128. screwdrivers: phillips ໄຂຄວງຫົວຈຸ້ມ.

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

129. screwdrivers: standart set ໄຂຄວງ ທຳມະດາ.

130. screw thread gauge: ເຄື່ອງວັດແທກກຽວຂອງຕະປູກຽວ.

131. seal installer set: ເຄື່ອງໃສ່ເຄື່ອງປ້ອງກັນຮົ່ວ.

132. seal removers: ເຄື່ອງດຶງ ເຄື່ອງປ້ອງກັນຮົ່ວ.

133. service jacks: assorted ເຄື່ອງຍົກລົດ ຊະນິດຕ່າງໆ.

134. slip joint pliers: assorted ຄີມປາກເລື່ອນໄດ້.

135. snap rings plier set: ຄີມ ຊະນິດພິເສດ ສຳລັບໃສ່ Snap ring.

136. snap ring truarc: internal/external ແຫວນສະປຣິງກັນລຸດ ໂດຍ
ບໍ່ຕ້ອງໃຊ້ ນ໊ອດ ຕົວແມ່.

137. snips, tin: assorted ມີດຕັດ ສຳລັບແຜ່ນເຫລັກບາງໆ.

138. soldering iron or gun: ເຄື່ອງເຊື່ອມ (໑໐໓).

139. spark plug cleaning machine: ເຄື່ອງລ້າງ ຫົວທຽນ.

140. spring tension: ກຳລັງຫ້າມການ ແຮງດຶງຂອງສະປຣິງ.

141. stamps, steel: letters and numbers ການປະທັບແຜ່ນເຫລັກໃຫ້
ເປັນຕົວໜັງສື.

142. steam jenny: a high pressure steam or combination cleaner ເຄື່ອງ
ສີດ ໂດຍໃຊ້ກຳລັງລົມ ປະສົມອາຍນ້ຳ.

143. straight edge: ໄມ້ບັນທັດ.

144. suction gun: ປືນດູດນ້ຳມັນ.

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

145. tack dwell units: ເຄື່ອງວັດຈານຈ່າຍເປັນອົງສາ.

146. tap and die set: ເຄື່ອງມືທໍາກຽວ.

147. terminal kit and crimping tool: ຊຸດເຄື່ອງຫົວລົບສາຍໄຟ ທີ່ມີອັນ
ຈັບຕິງປາຍ.

148. test lights: high voltage and low voltage ເຄື່ອງກວດສອບກໍາລັງ
ໄຟສູງແລະຕໍ່າ.

149. thermostat tester: ເຄື່ອງທົດສອບ thermostate.

150. thread chaser: ເຄື່ອງມືເຮັດໃຫ້ກຽວສະອາດ.

151. tie-rod end remover: ເຄື່ອງມືເອົາລູກໝາກຂອງພວງມາໄລສ່ວນລຸ່ມ

152. timing light: ເຄື່ອງມືຕັ້ງໄຟຂອງຈານຈ່າຍ.

153. tire bead expander: ເຄື່ອງຂະຫຍາຍຂອບຍາງລົດ.

154. tire gauges: ເຄື່ອງວັດລົມຂອງຍາງ . ລົດ.

155. tire service machine: ເຄື່ອງບໍຣິການກ່ຽວກັບຍາງລົດ.

156. tire tube leak detector tank: ເຄື່ອງກວດຍາງຮົ່ວ.

157. torque converter flusher: ເຄື່ອງລ້າງ Torque Converter.

158. transmission funnels: ກວຍໃສ່ນໍ້າມັນເກັຽ.

159. transmission jack: ເຄື່ອງຍົກກະປຸກເກັຽ.

160. tubing wrenches: ກະແຈຂັນທໍ່ນ້ອຍໆ ສ່ວນຫຼາຍເຮັດດ້ວຍທອງ
ເຫຼືອງ.

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

161. U-joint press: ໝໍ້ຕໍ່ທີ່ເພົາລົດ.

162. undercutter: ຄົມສາຍຂອງຫຼຸດ.

163. utility chain with hoods: ສາຍໂສ້ທີ່ມີປອກ.

164. valve guide replacement tool: ເຄື່ອງປ່ຽນປອກຂອງລີ້ນສູບ.

165. valve guide resizing tool: ເຄື່ອງມືສໍາລັບຂະຫຍາຍປອກຂອງລີ້ນສູບ.

166. valve insert tool: ເຄື່ອງໃສ່ລີ້ນສູບເຂົ້າໄປ.

167. valve reconditioning equipment: ເຄື່ອງບົດລີ້ນສູບ.

168. valve spring compressor: ເຄື່ອງກົດສະປຣິງຂອງລີ້ນສູບ.

169. valve spring tester: ເຄື່ອງທົດສອບສະປຣິງຂອງລີ້ນສູບ.

170. vise grip pliers: ຄີມຊະນິດຈັບໃຫ້ແໜ້ນແລ້ວວາງມືໄດ້.

171. vise, machinists: assorted ຄີມສໍາລັບຈັບຊະນິດຕ່າງໆ

172. volt-amp tester: ເຄື່ອງທົດສອບ Volt ແລະ Amp.

173. voltmeter: ເຄື່ອງວັດກໍາລັງໄຟ (Volt).

174. welding equipment, oxyacetylene: ເຄື່ອງເຊື່ອມ (ຈອດ) ເຫຼັກແບບໃຊ້ ກ໊າສ.

175. wheel alignment equipment: ເຄື່ອງຕັ້ງສູນຂອງລໍ້ລົດ.

176. wheel balancer, bubble: ເຄື່ອງເຮັດໃຫ້ລໍ້ໝູນທ່ຽງຕົງ.

AUTOMOTIVE MECHANICS: Equipment and Tools - (cont.)

177. wheel balancer, spin-type: ເຄື່ອງ ຕັ້ງ ລໍ້ ໃຫ້ ໝູນ ທ່ຽງທຽງ.

178. wheel balancer, strobe: ເຄື່ອງ ຕັ້ງ ລໍ້ ໂດຍ ໃຊ້ ໄຟຟ້າ.

179. wheel lug wrench: x-type; 4-way ເຄື່ອງມືຂັນ ເອົາລໍ້ ຖອດ ອອກ.

180. wheel puller: ເຄື່ອງ ດຶງ ລໍ້ ອອກ ຈາກ ເພົາ.

181. wrench drive adapters: ອັນ ປ່ຽນແປງ ຂະໜາດ ຂອງ ເຄື່ອງມືຂັນ.

182. wrenches: adjustable set ກະແຈ ເລື່ອນ.

183. wrenches: air impact ເຄື່ອງມືຂັນ ຈະມິດ ໃຊ້ ລົມດັນ

184. wrenches: Allen ກະແຈ ເປັນ ຮູ ຫົກແປ່ຽມ ຂ້າງ ຫົວ.

185. wrenches: box ກະແຈ ແຫວນ.

186. wrenches: ignition set ຊຸດ ກະແຈ ສຳລັບ ຈານຈ່າຍ.

187. wrenches: open-end and combination box wrench set ກະແຈ ປາກ ຕາຍ ຈະມິດ ເທົ່າສະຕາ. ກັບ ກະແຈ ແຫວນ.

188. wrenches: socket set, 1/2 in. drive ກະແຈ ມື ກະປອກ ຈະມິດ ປ່ຽນ ຫົວ ໄດ້ ຂະໜາດ 1/2 ນິ້ວ ຫົວສຽບ.

189. wrenches: socket set, 3/8 in. drive ຫົວສຽບ ຂະໜາດ 3/8 ນິ້ວ.

190. wrenches: socket set, 3/4 in. drive ຫົວ ສຽບ ຂະໜາດ 3/4 ນິ້ວ.

191. wrenches: socket set, 1/4 in. drive ຫົວ ສຽບ ຂະໜາດ 1/4 ນິ້ວ

192. wrenches: torque, inch/lbs. ກະແຈ ທີ່ ຕັ້ງ ແຮງ ຂັນ ໄດ້ ເປັນ ໜ່ວຍ ນິ້ວ ຕໍ່ ປອນ.

193. wrenches: torque, foot/lbs. ກະແຈ ທີ່ ຕັ້ງ ແຮງ ຂັນ ເປັນ ໜ່ວຍ ຟຸດ ຕໍ່ ປອນ.